

# S800 I/O

## Modules and Termination Units

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# **S800 I/O**

## **Modules and Termination Units**

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# Safety Summary



### Electrostatic Sensitive Device

Devices labeled with this symbol require special handling precautions as described in the installation section.

### GENERAL WARNINGS

#### Equipment Environment

All components, whether in transportation, operation or storage, must be in a noncorrosive environment.

#### Electrical Shock Hazard During Maintenance

Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing.

### SPECIFIC CAUTIONS

Page-56: Since the module has normally closed relay contacts the field power must be removed before replacement. It may be necessary to set the process device manually to a safe state before the module is extracted. Turning locking mechanism deactivates the module, that is, relay contacts will close.

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# Safety Summary

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# About This User Manual

## General



Any security measures described in this User Manual, for example, for user access, password security, network security, firewalls, virus protection, etc., represent possible steps that a user of an 800xA System may want to consider based on a risk assessment for a particular application and installation. This risk assessment, as well as the proper implementation, configuration, installation, operation, administration, and maintenance of all relevant security related equipment, software, and procedures, are the responsibility of the user of the 800xA System.

This book provides a description of S800 I/O modules and termination units. It provides instructions for site planning and installation, start-up and shutdown procedures, and information regarding capacity and performance. This book is not intended to be the sole source of instruction for the S800 I/O system.

## User Manual Conventions

Microsoft Windows conventions are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, etc.

## Feature Pack

The Feature Pack content (including text, tables, and figures) included in this User Manual is distinguished from the existing content using the following two separators:

Feature Pack Functionality

<Feature Pack Content>

Feature Pack functionality included in an existing table is indicated using a table footnote (\*):

\* Feature Pack Functionality

Feature Pack functionality in an existing figure is indicated using callouts.

Unless noted, all other information in this User Manual applies to 800xA Systems with or without a Feature Pack installed.

Warning, Caution, Information, and Tip Icons

This User Manual includes Warning, Caution, and Information where appropriate to point out safety related or other important information. It also includes Tip to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:



Electrical warning icon indicates the presence of a hazard that could result in *electrical shock*.



Warning icon indicates the presence of a hazard that could result in *personal injury*.



Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard that could result in *corruption of software or damage to equipment/property*.



Information icon alerts the reader to pertinent facts and conditions.



Tip icon indicates advice on, for example, how to design your project or how to use a certain function



Although Warning hazards are related to personal injury, and Caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, fully comply with all Warning and Caution notices.

## Terminology

A complete and comprehensive list of terms is included in *System 800xA System Guide Functional Description (3BSE038018\*)*. The listing includes terms and definitions that apply to the 800xA System where the usage is different from commonly accepted industry standard definitions and definitions given in standard dictionaries such as Webster's Dictionary of Computer Terms. Terms that uniquely apply to this instruction may be included here as part of this document.

Term	Description
FCI	The Fieldbus Communication Interface (FCI) device contains the interface to the fieldbus (for example PROFIBUS or AF100).
G3 compliant	The module withstand more severe environmental conditions according to ISA-S71.04.
I/O cluster	An I/O cluster can have up to 12 I/O devices.
I/O device	A complete I/O device consists of one MTU and one I/O module.
I/O module	Is an active, electronic and signal conditioning unit. Can be a part of an I/O device or a S800L I/O module.
I/O station	An I/O station consists of one or two FCI(s), 1-7 I/O clusters and up to 24 I/O devices.
ModuleBus	Is an incremental, electrical or optical, bus for interconnection of I/O devices.

ModuleBus master	ModuleBus master can be a controller (AC 800M) or a FCI. A ModuleBus master contains a ModuleBus interface and power regulators. The FCI module can manage 24 I/O devices and the controller up to 96 I/O modules (up to 12 directly and to the others in 1 to 7 I/O clusters).
MTU	The Module Termination Unit is a passive base unit containing process terminals and a part of the ModuleBus.
OSP	Outputs Set as Predetermined. A user configurable action on an output module when communications is lost to the FCI or Controller
RTD	Resistance Temperature Detector
SOE	Sequence of events. Time stamping of status changes for digital inputs.
TC	Thermocouple

## Related Documentation

The following is a listing of documentation related to the S800 I/O system.

*Table 1. List of Documents Related to S800 I/O system*

Title	Description
S800 I/O Getting Started	Describes the general installation and configuration information for the S800 I/O system.
S800 I/O Modules and Termination Units with Intrinsic Safety Interface	Describes the modules and termination units with I.S. interface in the S800 I/O system.
S800 I/O Fieldbus Communication Interface for AF100 User's Guide	Describes the AF100 FCI in the S800 I/O system.

Table 1. List of Documents Related to S800 I/O system (Continued)

Title	Description
S800 I/O Fieldbus Communication Interface for PROFIBUS-DP/DPV1	Describes the PROFIBUS-DP FCI in the S800 I/O system.
S800 I/O PROFIBUS_DP Fieldbus Communication Interface Reference Manual	Describes the memory mapping on PROFIBUS for the S800 I/O system.
Interference-free Electronics	Describes the rules for the installation of equipment to ensure the correct operation of equipment in environments where disturbance are present.

## Released User Manuals and Release Notes

A complete list of all User Manuals and Release Notes applicable to System 800xA is provided in *System 800xA Released User Manuals and Release Notes (3BUA000263\*)*.

*System 800xA Released User Manuals and Release Notes (3BUA000263\*)* is updated each time a document is updated or a new document is released. It is in pdf format and is provided in the following ways:

- Included on the documentation media provided with the system and published to ABB SolutionsBank when released as part of a major or minor release, Service Pack, Feature Pack, or System Revision.
- Published to ABB SolutionsBank when a User Manual or Release Note is updated in between any of the release cycles listed in the first bullet.



A product bulletin is published each time *System 800xA Released User Manuals and Release Notes (3BUA000263\*)* is updated and published to ABB SolutionsBank.



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## Section 1 Introduction

The S800 I/O is distributed as modular I/O that communicates with numerous controllers over Advant Fieldbus 100 (AF100), PROFIBUS-DP, or directly. The S800 I/O provides easy installation of the I/O modules and process cabling. It is highly modularized and flexible so that I/O modules can be combined to suit many applications. The S800 I/O can be mounted in many configurations to fit most requirements.



*Figure 1. S800 I/O with Fieldbus Communication Interface CI801 and I/O Modules Mounted on Compact Type Termination Units.*

## Product Overview

The S800 I/O provides easy installation of the I/O modules and process cabling. It is highly modularized and flexible so that the I/O modules can be combined to suit many applications, including most types of signals, HART and Intrinsic Safety Interface. The S800 I/O modules and a Fieldbus Communication Interface (FCI) are combined to form an I/O Station. The S800 I/O can be used in both single and redundant applications.

In general, all S800 units are G3 compliant. G3 compliant modules withstand more severe environmental conditions according to ISA-S71.04. The following S800 units are G2 compliant - SD821, SD822, SD823, SD831, SD832, SD833, SD834, SS822, SS832, TB811 and CI830. G3 compliant versions of SD822 and SS822 are also available (refer to SD822Z and SS822Z).

All modules are marked with a bar code that shows the serial number, article ID and the product revision number. A separate bar code strip is also enclosed along with the module for placing on the module, if needed. The bar code is of type Bar-code 128.

For more information, refer to *S800 I/O Getting Started(3BSE020923\*)* manual.

The S800 I/O can be categorized into:

- Module Termination Units (MTU)
- I/O modules – S800 I/O modules and S800L I/O modules.

S800 I/O modules are designed to be used together with a Module Termination Unit.

S800L I/O modules are designed to be directly mounted on a standard DIN rail.

The module also contains terminals for connections.

## Module Termination Units and Terminal Units

The Module Termination Units (MTU) are passive base units used to house the I/O modules. They contain the process wiring terminals and a section of the ModuleBus.

The Module Termination Units (MTU) distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The top part of the MTU can be removed to replace the termination board even with the system running. Such a need can be caused by a damaged terminal screw.

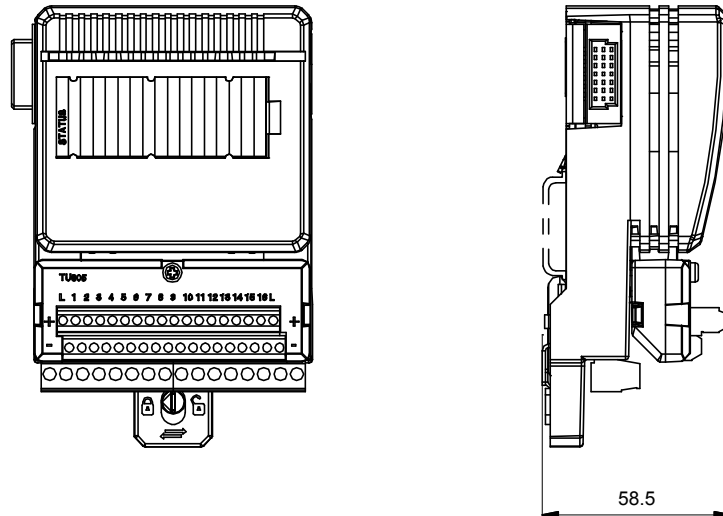
The MTUs are available in three versions (Compact, Extended and Redundant).

The Compact MTU version typically provides for a compact installation of the I/O modules using 1 wire connections.

The Extended MTU version provides for a more complete installation on the MTU, including 3 wire connection, fuses and field circuit power distribution. See [Figure 3](#) and [Figure 4](#) for an illustration of the MTUs together with the I/O modules.

The Redundant MTUs are used in redundant I/O applications. There is space on the MTU for two I/O modules on separate ModuleBuses. See [Figure 5](#).

The Terminal Unit is a passive unit that enables 2- and 3-wire connections of process signals. The Terminal Unit is mounted direct on an S800L I/O module. See [Figure 2](#), S800L I/O module with terminal unit TU805.



*Figure 2. S800L Module with TU805*



See [Table 2](#) for information about the combination between MTU and I/O modules and to specifications in [Appendix A, Specifications](#) for more information.

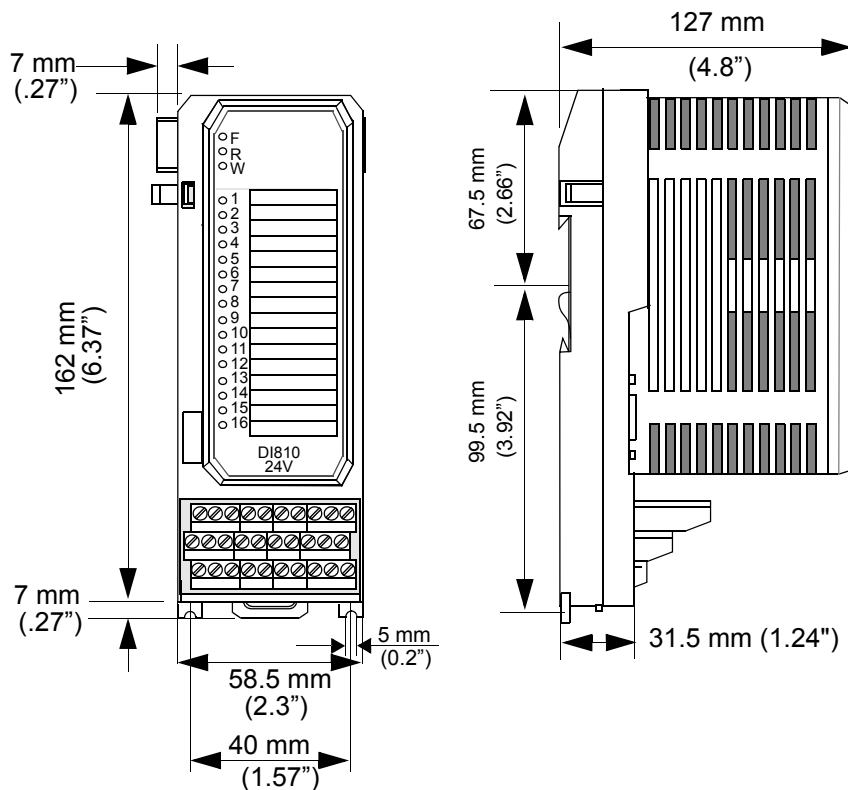


Figure 3. Typical Compact MTU with I/O Module

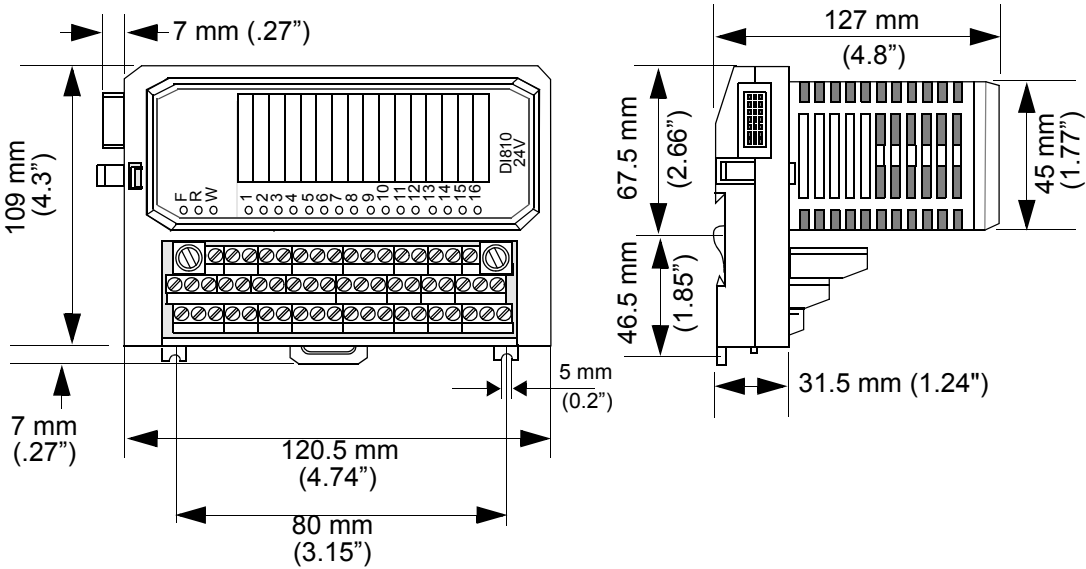
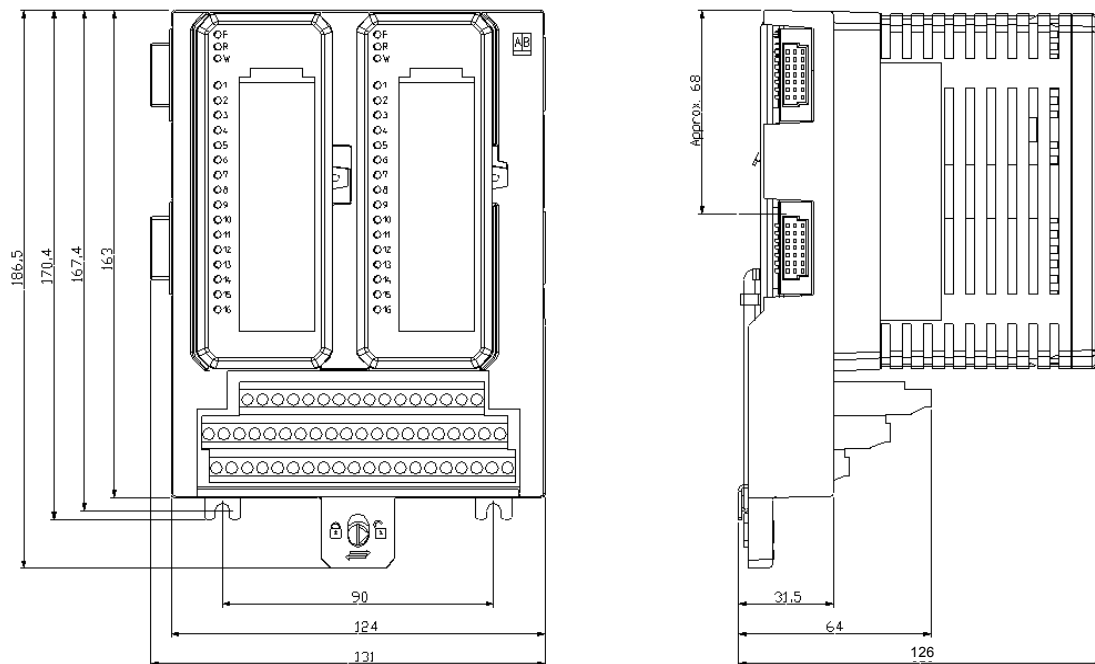


Figure 4. Typical Extended MTU with I/O Module



*Figure 5. Typical Redundant MTU with I/O Module*

### **TU805 Terminal Unit for 50 Volt Applications**

The TU805 is a 16 channel terminal unit. Used to enable 2- and 3-wire connections on DI801 or DO801. The Terminal Unit is mounted direct on DI801 or DO801.

### **TU810/TU810V1 Compact MTU for 50 Volt Applications**

The TU810 is a 16 channel compact module termination unit. The TU810 has three rows of terminals for field signals and process power connections.

**TU811/TU811V1 Compact MTU for 250 Volt Applications**

The TU811 is a 8 channel compact module termination unit. The TU811 has three rows of terminals for field signals and process power connection.

**TU812/TU812V1 Compact MTU for 50 Volt Applications and 25 pin D-sub for Process Connections**

The TU812 is a 16 channel compact module termination unit. The TU812 has a 25 pin D-Sub connector for field signals and process power connections.

**TU813 Compact MTU for 250 V Applications**

The TU813 is a 8 channel compact module termination unit. The TU813 has three rows of crimp snap-in connectors for field signals and process power connections.

**TU814/TU814V1 Compact MTU for 50 Volt Applications**

The TU814 is a 16 channel compact module termination unit. The TU814 has three rows of crimp snap-in connectors for field signals and process power connections.

**TU818 Compact MTU for 50 Volt Applications**

The TU818 is a 32 channel compact module termination unit. It consists of 40 pole screw-terminals for process connections.

**TU819 Compact MTU for 50 Volt Applications**

The TU819 is a 32 channel compact module termination unit. It consists of two D-sub 25 pole connector for field signals and process power connections, which enables connection to the Phoenix Varioface, ABB interfast and so on.

**TU830/TU830V1 Extended MTU for 50 Volt Applications**

The TU830 is a 16 channel extended module termination unit. The TU830 has three rows of terminals for field signals and process power connection.

**TU831/TU831V1 Extended MTU for 250 Volt Applications**

The TU831 is a 8 channel extended module termination unit. TU831 has two rows of terminals for field signals and process power connection.

**TU833 Extended MTU for 50 Volt Applications**

The TU833 is a 16 channel extended module termination unit. The TU833 has three rows of spring-case terminals for field signals and process power connection.

**TU834 Extended MTU for 50 Volt Applications**

The TU834 is a 8 channel extended module termination unit. The MTU has two rows of terminals for field signals and process power connection. The MTU has place for 8 replaceable shunt sticks (i.e one shunt stick per channel) for conversion of the input current signal to a voltage signal.

**TU835/TU835V1 Extended MTU, Individually Fused per Channel for 50 Volt Applications**

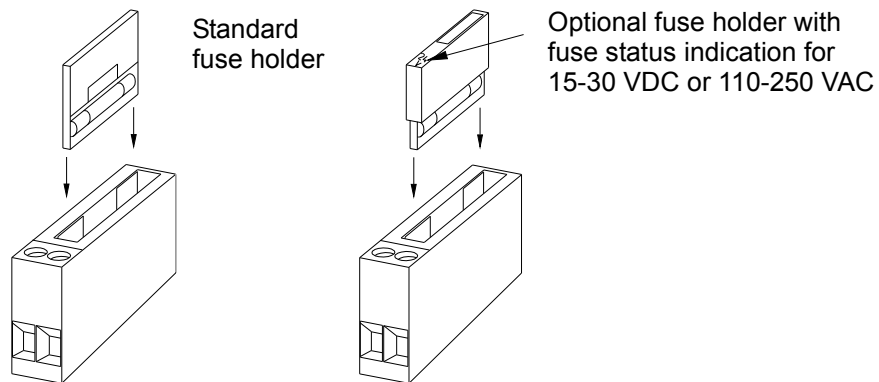
The TU835 is a 8 channel extended module termination unit. The TU835 has two rows of terminals for process power connection and a single row of field signal connections. Each channel has one fused (3 A max.) transmitter power outlet terminal and one signal terminal. Process voltage can be connected to 2 individually isolated groups.

**TU836/TU836V1 Extended MTU, Individually Fused per Channel for 250 Volt Applications**

The TU836 is a 8 channel extended module termination unit. The TU836 has two rows of terminals for field signals and process power connection. Each channel has one fused (3 A max.) power outlet terminal and one signal return terminal. Process voltage can be connected to 2 individually isolated groups.



The standard fuse holder that comes with the TU836 can be changed to an indicating fuse holder. This indicating fuse holder can be ordered from Phoenix Contact:  
15-30 VDC type, order 3118119  
110-250 VAC type, order 3118106.



*Figure 6. Exchange of Standard Fuse Holder for Indication Type*

### **TU837/TU837V1 Extended MTU, Individually Fused per Channel for 250 Volt Applications**

The TU837 is a 8 channel extended module termination unit. The TU837 has two rows of terminals for field signals and process power connection. Each channel has one fused (3 A max.) power outlet terminal and two signal terminals. Process voltage return can be connected to two individually isolated groups.

### **TU838 Extended MTU, Individually Fused per Channel for 50 Volt Applications**

The TU838 is a 16 channel extended module termination unit. The TU838 has two rows of terminals for field signals and process power connection. Each channel has one fused (3 A max.) transmitter power outlet terminal and one signal terminal. Process voltage can be connected to two individually isolated groups.

### **TU839 Extended MTU for 250 Volt Applications**

The TU839 is a 8 channel extended module termination unit. TU839 has two rows of terminals for field signals and process power connection. Each channel has one sensor power outlet terminal and two signal terminals. Process voltage can be connected to two individually isolated groups.

**TU842 Redundant Horizontal MTU for 50 V Applications**

The TU842 is a 16 channel redundant module termination unit. The TU842 has three rows of terminals for field signals and process power connection. It is intended for mounting on a horizontal DIN rail. There is space on the MTU for two I/O modules connected to separate ModuleBuses.

**TU843 Redundant Vertical MTU for 50 V Applications**

The TU843 is a 16 channel redundant module termination unit. The TU843 has three rows of terminals for field signals and process power connection. It is intended for mounting on a vertical DIN rail. There is space on the MTU for two I/O modules connected to separate ModuleBuses.

**TU844 Redundant Horizontal MTU for 50 V Applications**

The TU844 is a 8 channel redundant module termination unit. The TU844 has two rows of terminals for field signals and process power connection. It is intended for mounting on a horizontal DIN rail. The MTU has place for 8 replaceable shunt sticks (i.e one shunt stick per channel) for conversion of the input current signal to a voltage signal. There is space on the MTU for two I/O modules connected to separate ModuleBuses.

**TU845 Redundant Vertical MTU for 50 V Applications**

The TU845 is a 8 channel redundant module termination unit. The TU845 has three rows of terminals for field signals and process power connection. It is intended for mounting on a vertical DIN rail. The MTU has place for 8 replaceable shunt sticks (i.e one shunt stick per channel) for conversion of the input current signal to a voltage signal. There is space on the MTU for two I/O modules connected to separate ModuleBuses.

**TU850 Extended MTU, Individually Current Limited and Disconnectable per Channel for 50 V Applications**

The TU850 is a 16 channel extended module termination unit. TU850 has two rows of terminals for field signals and process power connection. Each channel has one current limited sensor/transmitter power outlet terminal and one signal terminal. Process voltage can be connected to two individually isolated groups.

**TU851 Extended MTU for 250 Volt Applications**

The TU851 250V Extended MTU Which allows a maximum of 16 isolated I/O channels and process voltage connections. It has a 32 pole screw-terminal for process connections.

**TU852 Redundant Horizontal MTU for 50 V Applications**

The TU852 is a redundant module termination unit for up to 16 channels. The TU852 has a two 25 pin D-Sub connector for field signals and process power connections. It is intended for mounting on a horizontal DIN rail. There is space on the MTU for two I/O modules connected to separate Modulebuses.

**TU854 Redundant Horizontal MTU for 50 V Applications**

The TU854 is a 8 channel redundant module termination unit. The TU854 has a 25 pin D-Sub connector for field signals and process power connections. It is intended for mounting on a horizontal DIN rail. The MTU has place for 8 replaceable shunt sticks (i.e one shunt stick per channel) for conversion of the input current signal to a voltage signal. There is space on the MTU for two I/O modules connected to separate ModuleBuses.

**TY801 Shunt Stick**

The TY801 is a shunt stick for current or voltage signals together with AI845 or AI880 and TU844 or TU845.

**TY804 Shunt Stick**

The TY804 is a shunt stick for NAMUR signals together with DP840 and TU844 or TU845.

**TY820 Temperature Sensor**

The TY820 can be used with AI835/AI835A and AI843 to measure cold junction temperature.



## S800 I/O Modules

The I/O modules have open ventilated plastic enclosures. On the front of all I/O modules there are at least three LEDs (FAULT, RUN and WARNING) indicating the module status. Additionally some modules have LEDs indicating OSP or PRIMARY, see [Table 3](#) and [Table 4](#).

I/O modules may be replaced in a fully operational I/O station. Mechanical keying on modules and MTUs protect I/O modules from being inserted in positions where they could be damaged by excessive voltage or current. An electronic type designation ID in each module keeps the I/O module from being taken into operation by the ModuleBus master, if a module's ID doesn't match the configured module type definition. There are modules for both single and redundant applications.

Refer to specifications in [Appendix A, Specifications](#) for more information.

### **AI810 Analog Input Module, 0...20 mA, 0...10 V**

The AI810 Analog Input Module has 8 current and voltage inputs. The inputs are independent for each channel, in that either voltage or current can be measured.

The current input is able to handle a short circuit to the transmitter supply without damage. The input withstand HART communication.

Nominal input ranges are: 0(4)... +20 mA, 0(2)... +10 V.

### **AI815 Analog Input Module, 0..20mA, 0..5V, HART**

The AI815 Analog Input Module has 8 analog inputs. The inputs can be configured for voltage or current.

The module has HART pass-through functionality.

Nominal input ranges are: 0(4)...+20 mA, 0(1)...+5 V.

### **AI820 Differential Analog Input Module, +/- 20 mA, +/- 10 V, +/- 5 V**

The AI820 Differential Analog Input Module has 4 differential, bipolar current/voltage inputs. This module is suitable for applications requiring high common mode rejection ratings, and/or bipolar voltage or current inputs. Nominal

input ranges are: -20...+20 mA, 0(4)...+20 mA, -10...+10 V, 0(2)...+10 V, -5...+5 V and 0(1)...+5 V.

The current input is able to handle a short circuit to the transmitter supply without damage. The input withstand HART communication.

**AI825 Galvanic Isolated Analog Input Module, -20...+20 mA, 0(4)...+20 mA, -10...+10 V, 0(2)...+10 V**

The AI825 Galvanic Isolated Analog Input Module has 4 individually galvanic isolated channels. This module is suitable for applications requiring galvanic isolated channels, and/or bipolar voltage or current inputs. Nominal input ranges are: -20...+20 mA, 0(4)...+20 mA, -10...+10 V, 0(2)...+10 V.

The current input is able to handle a short circuit to the transmitter supply without damage. The input withstand HART communication.

**AI830/AI830A RTD Input Module**

The AI830/AI830A Analog Input, RTD Module has 8 RTD (Pt100, Cu10, Ni100 and Ni120 and resistor) inputs. The inputs allow 3-wire connection to RTDs. Inputs are monitored for open-circuit, short-circuit. Reference channel and internal supply are also monitored.

**AI835/AI835A Thermocouple/mV Input Module**

The AI835/AI835A Analog Input, Thermocouple/mV Module has 8 differential inputs for TC/mV measurements. One channel (channel 8) can be configured for “Cold Junction” (ambient) temperature measurement, thus serving as the CJ-channel for the other channels on the module. All 8 channels can be used if no CJ-temperature measurement is needed. The inputs can be connected to a variety of thermocouples with the following characteristics: B, C, E, J, K, N, R, S and T also D, L and U for AI835A.

**AI843 Thermocouple/mV Input Module, for Single or Redundant Applications**

The AI843 Analog Input, Thermocouple/mV Module has 8 differential inputs for TC/mV measurements. A separate channel is used for Cold Junction (ambient)

temperature measurement. The input can be connected to a variety of thermocouples with the following characteristics: B, C, E, J, K, L, N, R, S, T and U.

#### **AI845 Analog Input Module, for Single or Redundant Applications**

The AI845 Analog Input Module has 8 analog inputs. Each channel can be either a voltage or current input. The module has advanced on-board diagnostics and HART pass-through functionality. It can be used in both single and redundant application. Nominal input ranges are: 0(4)...+20mA, 0(1)...+5V.

#### **AI880/AI880A High Integrity Analog Input Module for Single or Redundant Configuration**

The AI880/AI880A High Integrity Analog Input Module is TÜV certified for IEC 61508 SIL3, and EN 954-1 Category 4.

The AI880/AI880A has 8 analog inputs. The channels are for current input. The module has advanced on-board diagnostics. It can be used in both single and redundant configuration.

The AI880/AI880A complies with the NAMUR recommendation NE43, and supports configurable over- and under range limits.

AI880A has support for HART pass-through communication. Nominal input range is 0(4)...+20mA.

#### **A0810/AO810V2 Analog Output Module, 0...20 mA**

The AO810/AO810V2 Analog Output Module has 8 current outputs. State of outputs can be set to a predetermined (OSP) value if a communication error is detected. Nominal output range is: 0(4)... 20 mA.

#### **AO815 Analog Output Module, 4...20 mA, HART**

The AO815 Analog Output Module has 8 analog outputs. State of outputs can be set to a predetermined (OSP) value if a communication error is detected. The module has HART pass-through functionality. Nominal output range is 4...20 mA.

**AO820 Bipolar Analog Output Module, -20 mA...+20 mA, -10 V...+10 V**

The AO820 Bipolar Analog Output Module has 4 bipolar current or voltage outputs. The choice of either current or voltage output is configurable per channel. Outputs are individually galvanically isolated. State of outputs can be set to a predetermined (OSP) value if a communication error is detected. Nominal output range are: -20... +20 mA, 0(4)... +20 mA, -10... +10 V, 0(2)... +10 V.

**AO845/AO845A Analog Output Module, for Single or Redundant Applications**

The AO845/AO845A Analog Output Module has 8 analog outputs. State of outputs can be set to a predetermined (OSP) value if a communication error is detected. The module has advanced on-board diagnostics and HART pass-through functionality. It can be used in both single and redundant applications. Nominal output range is: 4...20mA.

**DI810 Digital Input Module, 24 V, Current Sinking**

The DI810 Digital Input Module has 16 channels for 24 volt d.c. digital inputs. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DI811 Digital Input Module, 48 V, Current Sinking**

The DI811 Digital Input Module has 16 channels for 48 volt d.c. digital inputs. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DI814 Digital Input Module, 24 V, Current Sourcing**

The DI814 Digital Input Module has 16 channels for 24 volt d.c. current source digital inputs. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DI818 Digital Input Module, 24 V, Current Sinking**

The DI818 Digital Input Module has 32 channels for 24 volt d.c. digital inputs. The inputs are divided into two isolated groups of 16 channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DI820 Digital Input Module, 120 V a.c./d.c.**

The DI820 Digital Input Module has 8 channels for 120 volt a.c./d.c. digital inputs. The inputs are individually isolated. Channel 1 can be used as voltage supervisor for channels 2 - 4, and channel 8 can be used for channels 5 - 7. If voltage supervision is disabled, channels 1 and 8 can be used as normal inputs. Each input channel provides current limiting, EMC protection, input state LED indicator, noise filter and optical isolation from the ModuleBus.

**DI821 Digital Input Module, 230 V a.c./d.c.**

The DI821 Digital Input Module has 8 channels for 230 volt a.c./d.c. digital inputs. The inputs are individually isolated. Channel 1 can be used as voltage supervisor for channels 2 - 4, and channel 8 can be used for channels 5 - 7. If voltage supervision is disabled, channels 1 and 8 can be used as normal inputs. Each input channel provides current limiting, EMC protection, input state LED indicator, noise filter and optical isolation from the ModuleBus.

**DI825 Digital Input Module, 125 V d.c. with SOE**

The DI825 Digital Input Module had 8 channels for 125 V d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 0.4 ms for each input channel. The inputs are individually isolated. Channel 1 can be used as voltage supervisor for channels 2 - 4, and channel 8 can be used for channels 5 - 7. If voltage supervision is disabled, channels 1 and 8 can be used as normal inputs. Each input channel provides current limiting, EMC protection, input state LED indicator, noise filter and optical isolation from the ModuleBus.

**DI828 Digital Input Module, 120 V a.c \ d.c**

The DI828 Digital Input Module has 16 channels for 120 volt a.c./d.c. digital inputs. The inputs are individually isolated. Channel 1 can be used as voltage supervisor for channels 2 - 8, and channel 16 can be used for channels 9 - 15. If voltage supervision is disabled, channels 1 and 16 can be used as normal inputs. Each input channel provides current limiting, EMC protection, input state LED indicator, noise filter and optical isolation from the ModuleBus.

**DI830 Digital Input Module, 24 V d.c. with SOE, Current Sinking**

The DI830 Digital Input Module has 16 channels for 24 volt d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 0.4 ms for each input channel. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DI831 Digital Input Module, 48 V d.c. with SOE, Current Sinking**

The DI831 Digital Input Module has 16 channels for 48 volt d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 0.4 ms for each input channel. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DI840 Digital Input Module, for Single or Redundant Applications**

The DI840 Digital Input Module has 16 channels for 24 V d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 1 ms for each input channel. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus. The module has advanced on-board diagnostics. It can be used in both single and redundant applications.

**DI880 High Integrity Digital Input Module, for Single or Redundant Configuration**

The DI880 High Integrity Digital Input Module is TÜV certified for IEC 61508 SIL3 and EN 954-1 Category 4.

The DI880 has 16 channels for 24 V d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 1 ms for each input channel. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus. The input voltage range is 18 to 30 V d.c. and the input current is 7 mA at 24 V d.c. The module has advanced on-board diagnostics. It can be used in both single and redundant configuration.

**DI885 Digital Input Module, 24 V/48 V d.c. with SOE, Current Sinking**

The DI885 Digital Input Module has 8 channels for 48 volt d.c. digital inputs with or without open-circuit monitoring (wire break supervision), or 24 volt d.c. electronic inputs without open-circuit monitoring; and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 1 ms for each input channel. The inputs are arranged in one group of 8 channels.

Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus. The DI885 also has the capability to monitor an internal or external sensor power supply (60 V d.c. max.).

**DO810 Digital Output Module, 24 V, 0.5 A, Current Sourcing**

The DO810 Digital Output Module has 16 channels for 24 volt d.c., 0.5 A, digital outputs. The outputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each output channel provides protection against short circuits to ground, over-voltage, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

**DO814 Digital Output Module, 24 V, 0.5 A**

The DO814 Digital Output Module has 16 channels for 24 volt d.c., 0.5 A, current sinking digital outputs. The outputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each output channel provides protection against short circuits to power supply, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

**DO815 Digital Output Module, 24 V, 2 A, Current Sourcing**

The DO815 Digital Output Module has 8 channels, 24 volt d.c., 2 A, digital outputs. The outputs are divided into two isolated groups of four channels with a voltage supervision input for each group. Each output channel provides protection against short circuits to ground, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

**DO818 Digital Output Module, 24 V, 0.5 A, Current Sourcing**

The DO818 Digital Output Module has 32 channels for 24 volt d.c., 0.5 A, digital outputs. The outputs are divided into two isolated groups of 16 channels with a voltage supervision input for each group. Each output channel provides protection against short circuits to ground, over-voltage, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

**DO820 Digital Output Module, Relay Normally Open**

The DO820 Digital Output Module has 8 channels for 230 volt a.c./d.c. relay outputs. The outputs are individually isolated. Each output channel provides a relay contact (NO - Normal Open), EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected. Internal voltage is supervised.



**DO821 Digital Output Module, Relay Normally Closed**

The DO821 Digital Output Module has 8 channels for 230 volt a.c./d.c. relay outputs. The outputs are individually isolated. Each output channel provides a relay contact (NC - Normal Closed), EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected. Internal voltage is supervised.

**DO828 Digital Output Module, Relay Normally Open**

The DO828 Digital Output Module has 16 channels for 250 AC / 125V DC relay outputs. The outputs are individually isolated. Each output channel provides a relay contact (NO - Normal Open), EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected. Internal voltage is supervised.

**DO840 Digital Output Module, for Single or Redundant Applications**

The DO840 Digital Output Module has 16 channels for 24 V d.c. The maximum continuous output current is 0.5 A. The module has advanced on-board diagnostics. It can be used in both single and redundant applications.

**DO880 High Integrity Digital Output Module, for Single or Redundant Configuration**

The DO880 High Integrity Digital Output Module is TÜV certified for IEC 61508 SIL3 and EN 954-1 Category 4.

The DO880 has 16 channels for 24 V d.c. The maximum continuous output current is 0.5 A. The module has advanced on-board diagnostics. It can be used in both single and redundant configuration.

**DP820 Incremental Pulse Counter Module**

DP820 is an two-channel pulse counting module for incremental pulse transmitters up to 1.5 MHz. Each channel contains counters and registers for position/length and speed/frequency measurement. Each channel provides three balanced inputs for connection of a pulse transmitter, one digital input and one digital output.

Pulse transmitters with RS422, +5 V, +12 V, +24 V and 13 mA interfaces can be connected to DP820.

**DP840 Incremental Pulse Counter Module, for Single or Redundant Applications**

DP840 has 8 channels and each channel can be configured for pulse count or frequency measurement. The maximum frequency of input signals is 20 kHz. The inputs can also be read as digital input signals.

Input signal range NAMUR, 12 V and 24 V.

**S800L I/O Modules**

The I/O modules have open ventilated plastic enclosures and a bottom of sheet metal. On the front of each I/O module there is one LED (STATUS) indicating the module status and digital I/O modules have one status LED for each channel. Refer to [Hardware Indicators](#) on page 47 for the status indication of the LEDs.

An electronic type designation ID in each module keeps the I/O module from being taken into operation by the ModuleBus master, if a module's ID doesn't match the configured module type definition.

Refer to specifications in [Appendix A, Specifications](#) for more information.

The module can be mounted on a standard DIN rail. The module is locked to the DIN rail by using the locking screw.

The process connection is done via detachable connectors.

The I/O module distributes the ModuleBus to the next module. It also generate the correct address to the next module by shifting the outgoing position signals.

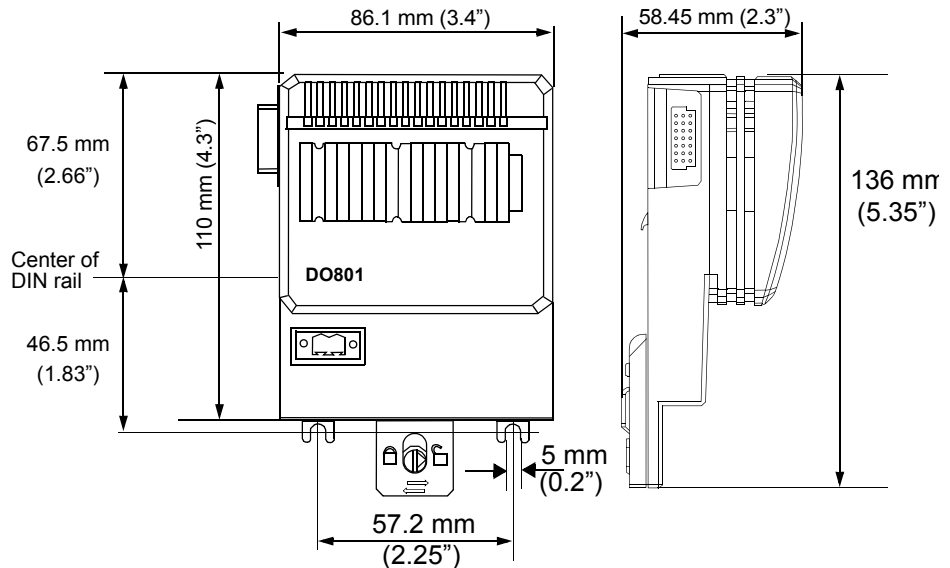


Figure 7. Dimensions for S800L Modules

### AI801 Analog Input Module, 0...20 mA

The AI801 Analog Input Module has 8 current inputs.

The current input is able to handle a short circuit to the transmitter supply without damage. The input withstands HART communication.

Nominal input ranges are: 0(4)... +20 mA.

### AO801 Analog Output Module, 0...20 mA

The AO801 Analog Output Module has 8 current outputs. State of outputs can be set to a predetermined (OSP) value if a communications error is detected. Nominal output range is: 0(4)... 20 mA.

**DI801 Digital Input Module, 24 V, Current Sinking**

The DI801 Digital Input Module has 16 channels for 24 volt d.c. digital inputs.

One input channel can be used for sensor voltage supervision. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DI802 Digital Input Module, 120 V a.c./d.c., Current Sinking**

The DI802 Digital Input Module has 8 channels for 120 volt a.c./d.c. digital inputs. Channel 8 can be used for sensor voltage supervision. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DI803 Digital Input Module, 230 V a.c./d.c., Current Sinking**

The DI803 Digital Input Module has 8 channels for 230 volt a.c./d.c. digital inputs. Channel 8 can be used for sensor voltage supervision. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

**DO801 Digital Output Module, 24 V, 0.5 V, Current Sinking**

The DO801 Digital Output Module has 16 channels for 24 volt d.c., 0.5 A, digital outputs. Each output channel provides protection against short circuits to ground, over-voltage, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

**DO802 Digital Output Module, 24-250 V, Relay Normally Open**

The DO802 Digital Output Module has 8 channels for 24-250 volt d.c., digital outputs. Each output channel provides protection against short circuits to ground, over-voltage, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

## **Prerequisites and Requirements**

When the S800 I/O is used with controllers as part of their I/O system, the controllers need to have an interface to the fieldbus network. The fieldbus network connects to a Fieldbus Communications Interface (FCI) with S800 I/O installed.



## Section 2 Configuration

### Module Termination Units (MTU)

Each MTU is used with certain types of I/O Modules. Refer to [Table 2](#) that shows the relationship between MTUs and I/O Modules. Each MTU has two mechanical keys that have to be set for the type of I/O module that is installed on it.

*Table 2. MTU Usage and Key Settings*

Module Type	TU810	TU812 TU814 Compact	TU818 Compact	TU819 Compact	TU811 TU813 Compact	TU830 TU833 Extended	TU831 Extended	TU834 Extended	TU835 Extended	TU836 TU837	TU838 Extended	TU839 Extended	TU842 TU843 TU852 Redundant	TU844 TU845 TU854 Redundant	TU850 Extended	TU851 Extended	Mech. Key Setting	
																	Key 1	Key 2
AI810	X	X	X	-	-	X	-	-	X	-	X	-	-	-	X	-	A	E
AI815	X	X	X	-	-	X	-	-	X	-	X	-	-	-	-	-	C	C
AI820	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	B	B
AI825	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	D	A
AI830/ AI830A	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	A	F
AI835/ AI835A	X	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	B	A
AI843	-	-	X	-	-	X	-	-	-	-	-	-	X	-	-	-	B	A
AI845	X	X	X	-	-	X	-	-	X	-	X	-	-	X	-	-	C	C

Table 2. MTU Usage and Key Settings (Continued)

Module Type	TU810	TU812 TU814 Compact	TU818 Compact	TU819 Compact	TU811 TU813 Compact	TU830 TU833 Extended	TU831 Extended	TU834 Extended	TU835 Extended	TU836 TU837	TU838 Extended	TU839 Extended	TU842 TU843 TU852 Redundant	TU844 TU845 TU854 Redundant	TU850 Extended	TU851 Extended	Mech. Key Setting	
																	Key 1	Key 2
AI880	-	-	-	-	-	-	-	X	-	-	-	-	-	X	-	-	F	F
AI880A	-	-	-	-	-	-	-	X	-	-	-	-	-	X	-	-	F	D
AO810/ AO810V2	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	A	E
AO815	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	D	B
AO820	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	B	C
AO845		X	-	-	-	X	-	-	-	-	-	-	X	-	-	-	C	C
AO845A	X	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-	D	B
DI810	X	X	X	-	-	X	-	-	-	-	X	-	-	-	X	-	A	A
DI811	X	X	X	-	-	X	-	-	-	-	X	-	-	-	X	-	B	D
DI814	X	X	-	-	-	X	-	-	-	-	X	-	-	-	-	-	B	E
DI818	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	E	A
DI820	-	-	-	-	X	-	X	-	-	-	-	X	-	-	-	X	A	B
DI821	-	-	-	-	X	-	X	-	-	-	-	X	-	-	-	X	A	C
DI825	-	-	-	-	X	-	X	-	-	-	-	X	-	-	-	X	A	B
DI828	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	E	B
DI830	X	X	X	-	-	X	-	-	-	-	X	-	-	-	X	-	A	A
DI831	X	X	X	-	-	X	-	-	-	-	X	-	-	-	X	-	B	D
DI840	X	X	X	-	-	X	-	-	-	-	X	-	X	-	-	-	C	D



Table 2. MTU Usage and Key Settings (Continued)

Module Type	TU810	TU812 TU814 Compact	TU818 Compact	TU819 Compact	TU811 TU813 Compact	TU830 TU833 Extended	TU831 Extended	TU834 Extended	TU835 Extended	TU836 TU837	TU838 Extended	TU839 Extended	TU842 TU843 TU852 Redundant	TU844 TU845 TU854 Redundant	TU850 Extended	TU851 Extended	Mech. Key Setting	
																	Key 1	Key 2
DI880	X <sup>(1)</sup>	X <sup>(1)</sup>	X <sup>(2)</sup>	-	-	X <sup>(2)</sup>	-	-	-	-	-	-	X <sup>(2)</sup>	-	-	-	F	F
DI885	X	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	B	F
DO810	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	A	A
DO814	X	X	-	-	-	X	-	-	-	-	X	-	-	-	-	-	B	E
DO815	X	X <sup>(3)</sup>	-	-	-	X	-	-	-	-	-	-	-	-	-	-	A	A
DO818	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	E	A
DO820	-	-	-	-	X	-	X	-	-	X	-	-	-	-	-	X	A	D
DO821	-	-	-	-	X	-	X	-	-	X	-	-	-	-	-	X	C	A
DO828	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	E	D
DO840	X	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-	C	E
DO880	X	X	-	-	-	X	-	-	-	-	-	-	X	-	-	-	F	E
DP820	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	C	B
DP840	X	X	X	-	-	X	-	-	-	-	-	-	X	X	-	-	C	F

(1) If single Compact MTUs (TU810, TU812 or TU814) are used, refer to the Technical Description 3BSE050455.

(2) If the outgoing sensor supplies are not used to feed the sensor in the field, refer to the Technical Description 3BSE050455.

(3) TU812 is not recommended due to the maximum rated current.

Connecting an MTU to the ModuleBus master, cluster modem or to another MTU, automatically sets up the address selection of that MTU. There are no jumpers or switches that need to be set before installing an I/O module.

MTUs are placed on the DIN rails, and then connected to the preceding MTU, ModuleBus master or cluster modem. Once connected, the MTU is locked in place by the bottom latch which also bonds it to the chassis ground.

## I/O Modules

### S800 I/O Modules

Each I/O module is installed on an MTU. [Table 2](#) shows the MTUs that can be used with each I/O module type. I/O modules do not have any jumpers or switches that need to be set before installing on an MTU. Refer to [Appendix A, Specifications](#) for more information.

I/O modules are installed by aligning the connectors of the MTU and I/O module and then pushing the units together. After connected to the MTU, the I/O module is then locked in place by the I/O Module Lock/Switch which also activates a switch to enable power to the I/O module.

### S800L I/O Modules

The I/O modules are installed directly on the DIN rail and locked with the locking screw. The process signal are connected to a pluggable connector on the module.

There are no jumpers or switches that need to be set.

The I/O module automatically set up the address for the next I/O module.

To enable 2- and 3-wire connection to 16 channels DI and DO modules, TU805 is used. TU805 is mounted directly on the module.

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## Section 3 Maintenance

### Preventive Maintenance

For preventive maintenance, refer to *S800 I/O Getting Started (3BSE020923\*)* manual.

### Hardware Indicators

#### S800 I/O Module LEDs

[Figure 8](#) shows examples of front panels for different types of I/O modules. On the front of all I/O modules, there are at least three LEDs (FAULT, RUN and WARNING) indicating the module status. Additionally, some modules have LEDs indicating OSP or PRIMARY, see [Table 3](#) and [Table 4](#).

Each digital channel has one LED indicating the current state (on/off).

Table 3. Standard LEDs on S800 I/O Modules

Marking	Color	Description
F (FAULT)	Red	Fatal internal module error is detected (Error State) or I/O module is in any of the start-up states (Init State or Not Configured State). <sup>(1)</sup>
R (RUN)	Green	I/O module is running in Operational State.
W (WARNING)	Yellow	Internal or external channel error is detected, (module continues to run).
O (OSP)	Yellow	I/O module is in OSP (Output Set to Predetermined) State where the outputs are driven to the OSP value. OSP State is entered upon demand from the master (e.g. Profibus) or automatically due to lack of incoming communication.
PRIM (PRIMARY)	Yellow	I/O module is primary within a redundant pair. <sup>(2)</sup>
Channel status	Yellow (red)	Indicates the current state (on/off). On some modules this LED also indicates channel error (red).

- (1) The FAULT LED is turned on at power-on and restart. The LED is turned off after the first successful access to the module in Not Configured State. If a module with advanced diagnostics detects a fatal internal error, it enters Error State and turns on the FAULT LED.
- (2) In a redundant configuration, the primary I/O module is scanned at the specified cycle time to supply input values to the application, while the backup I/O module is scanned at a lower cycle for diagnostic purpose. The input values from the backup module are not used by the application.

Table 4. S800 I/O Module LED Indications in Different States

Module state	Run	Fault	Warning	OSP	Primary	Channel status
Init	Off	On	Off	Off	Off	DI On/Off <sup>(1)</sup> , DO Off
Not Configured	Flashing/ Off	On/Off <sup>(2)</sup>	On/Off	Off	Off	DI On/Off <sup>(1)</sup> , DO Off
Ready	Flashing/ Off	Off	On/Off	Off	Off	DI On/Off, DO Off
Operational	On	Off	On/Off	Off	On/Off	On/Off
OSP	On	Off	On/Off	On	On/Off	On/Off
Error	Off	On	On/Off	Off	Off	DI On/Off, DO Off

(1) The DI signal status for module DI830, DI831, DI880, DI885, DP820 is only OFF.

(2) Will be switched off after the first successful access to the module.

Normally when an I/O module has been removed from the configuration, the ModuleBus master will do a restart of the module. The module will end up in the NOT CONFIGURED state.

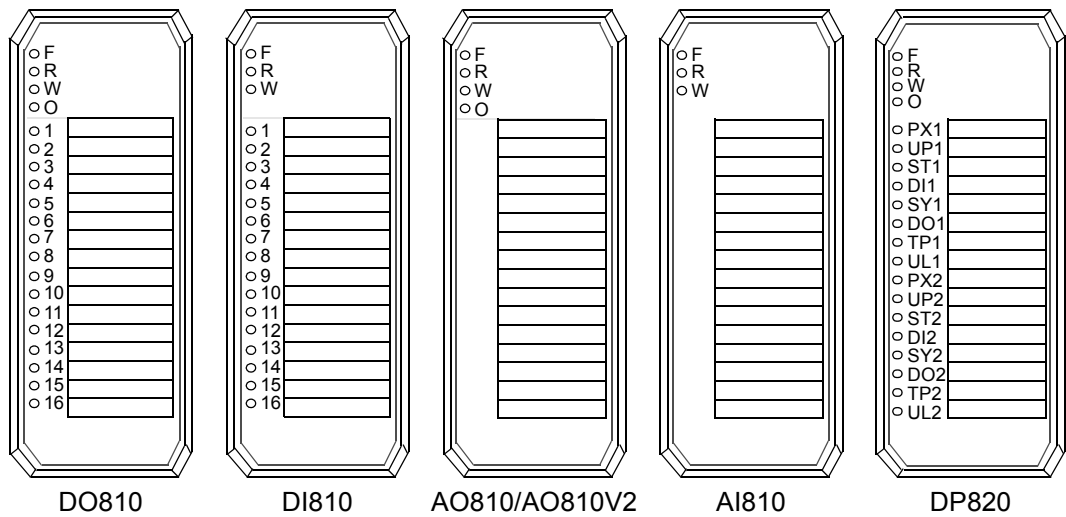


Figure 8. Examples of S800 I/O Module LED Locations

S800L I/O Module LED

Figure 9 shows examples of front panels for different types of I/O modules. On the front of each I/O module there is one LED indicating the module status.

See Table 5 and Table 6 for information on the meaning and indications for these modules.

Each digital channel has one LED indicating current state (on/off).

Table 5. Standard LED on S800L I/O Modules

Marking	Color	Description
S (Status)	Red	Fatal internal module error is detected (ErrorState) or I/O module is in any of the start-up states (Init State or Not Configured State). <sup>(1)</sup>
	Green	I/O module is running in Operational State or OSP State.

(1) The Status LED is indicating red at power-on and restart. The LED is turned off after the first successful access to the module in Not Configured State. If a module with advanced diagnostics (for example, AI/AO) detects a fatal internal error, it enters Error State and turns on the FAULT LED.

Table 6. S800L I/O Module LED Indications in Different States

Module state	Status	Channel status
Init	Red	Off
Not Configured	Red/off <sup>(1)</sup>	Off
Ready	Off	DI On/Off, DO Off
Operational	Green	On/Off

Table 6. S800L I/O Module LED Indications in Different States (Continued)

Module state	Status	Channel status
OSP	Green	On/Off
Error	Red	DI On/Off, DO Off

(1) Will be switched off after the first successful access to the module.

Normally when an I/O module has been removed from the configuration, the ModuleBus master will do a restart of the module. The module will end up in the NOT CONFIGURED state.

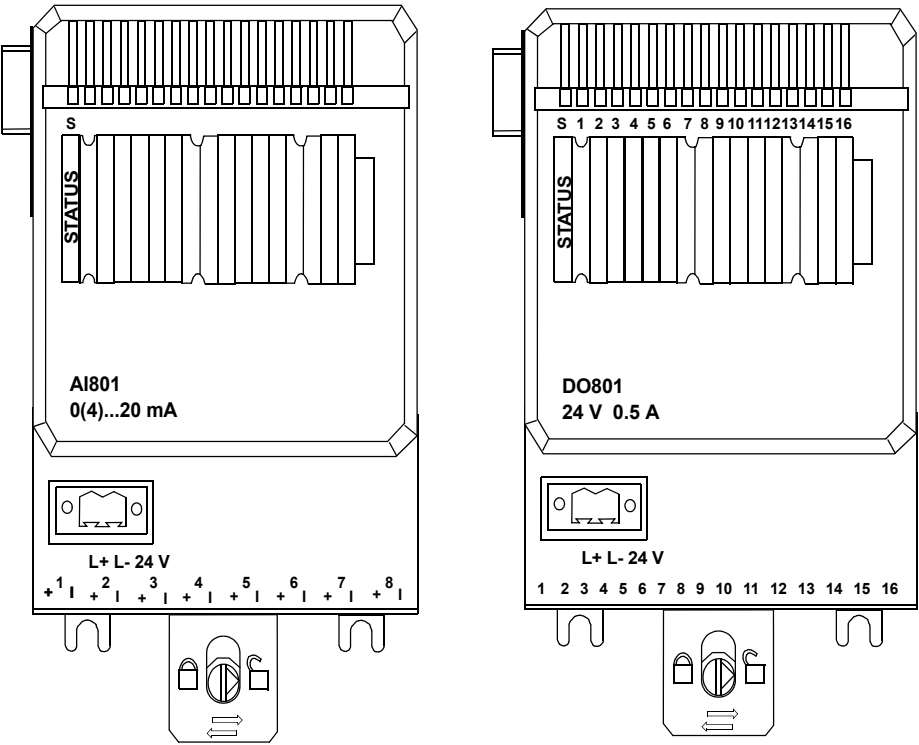


Figure 9. Examples of S800L I/O Module LED Locations



## Error Messages

Refer the relevant controller manuals.

## Fault Finding and User Repair

### S800 I/O Module Replacement

#### General

All I/O modules can be exchanged online and with the process power supply connected, except for relay outputs with normally closed contacts. This is possible because the module deactivates when the I/O module lock switch is turned to unlock.



Replacement of an S800 I/O module affects all channels on the module. In some cases, it indirectly affects the outputs through some application function, on another module.

The system software in the ModuleBus master checks automatically that all I/O modules function correctly. In the event of module fault, and module exchange, the module and associated signals are marked as faulty.

The system software checks that the module that is inserted is correct. If this is the case, the F(ault) LED is turned off, and after the initial configuration, and the R(un) LED activated, and the module resumes its normal function.

The following topics contain general instructions for replacement of modules, and [Table 7](#) gives additional information about handling the replacement of individual modules.

#### Practical Execution

Before replacing the faulty I/O module:

1. Refer to *S800 I/O Getting Started (3BSE020923\*)* manual.
2. As special restrictions apply to each module type, see the descriptions in [Table 7](#) for useful information on individual module types.
3. Check if the new module can be a suitable replacement.

To replace the module:

- 1. Loosen the module locking.
- 2. Grip the module firmly and extract the module.
- 3. Insert the new module carefully.
- 4. Store extracted modules in envelopes.
- 5. Ensure that the module contacts connect properly with the contacts in the MTU, and then lock the module in place.

The module is initialized automatically by the system, and the F(ault) LED is turned off and the R(un) LED is activated.

- 6. Perform a function test on the new module.

**Additional Information for Replacement of Individual S800 I/O Modules**

Table 7 lists S800 I/O modules and provides additional information for replacement of the modules.

Table 7. Replacement information for S800 I/O Modules

Module Type	Settings	Comments
AI810, AI815, AI820, AI825, AI830, AI830A, AI835, AI835A, AI843, AI845, AI880, AI880A, AI890, AI895 Analog Input	No settings	Replacement with power applied is possible.  Turning locking mechanism deactivates the module.
AO810, AO815, AO810V2, AO820, AO845, AO845A, AO890, AO895 Analog Output	No settings	Replacement with power applied is possible.  It may be necessary to set the process device manually to a safe state before the module is extracted.  Turning locking mechanism deactivates the module.

Table 7. Replacement information for S800 I/O Modules (Continued)

Module Type	Settings	Comments
DI810, DI811, DI814, DI820, DI821, DI890 Digital Input	No settings	Replacement with power applied is possible. Turning locking mechanism deactivates the module.
DI825, DI830, DI831, DI840, DI880, DI885 Digital Input with SOE	No settings	Replacement with power applied is possible. Turning locking mechanism deactivates the module.
DO810, DO814 DO815, DO840, DO880, DO890 Digital Output	No settings	Replacement with power applied is possible. It may be necessary to set the process device manually to a safe state before the module is extracted. Turning locking mechanism deactivates the module. If DO880 is removed from the MTU, the connected output is automatically turned to safe state (de-energized).
DO820 Digital Output	No settings	Replacement with power applied is possible. It may be necessary to set the process device manually to a safe state before the module is extracted. Turning locking mechanism deactivates the module.

Table 7. Replacement information for S800 I/O Modules (Continued)


Module Type	Settings	Comments
DO821 Digital Output	No settings	<p>Replacement with system power applied is possible.</p> <p> Since the module has normally closed relay contacts, the field power must be removed before replacement.</p> <p>It may be necessary to set the process device manually to a safe state before the module is extracted.</p> <p>Turning locking mechanism deactivates the module, that is, the relay contacts close.</p>

Table 7. Replacement information for S800 I/O Modules (Continued)

Module Type	Settings	Comments
DP820, DP840 Pulse Counter	No settings	Replacement with power applied is possible.  It may be necessary to set the process device manually to a safe state before the module is extracted.  Turning locking mechanism deactivates the module.
TU810/TU810V1, TU811/TU811V1, TU812/TU812V1, TU813, TU814/TU814V1, TU830/TU830V1, TU831/TU831V1, TU833, TU834, TU835/TU835V1, TU836/TU836V1, TU837/TU837V1, TU838, TU839, TU842, TU843, TU844, TU845, TU850 MTUs	No settings	Cannot be replaced or repaired with power applied.  Disconnecting an MTU breaks the ModuleBus communications bus and removes power to the MTUs that follow.  MTUs mounted in the middle (between the ModuleBus master, cluster modem and the number 12 MTU) need to have the preceding or following MTUs moved in order to disconnect the ModuleBus connector.

## S800L I/O Module Replacement

### General

I/O modules can not be replaced online. The power must be switched off to the I/O station and the module, before replacing the I/O module.



A power switch off to an I/O station affects all modules and channels in the station. It also sometimes indirectly affects the outputs in other I/O stations through some application functions

The system software checks that the module that is inserted is correct. If this is the case, the color indication on the S(tatus) LED turns from red to no color, and then to green, and the module resumes its normal function.

The following topics contain general instructions for replacement of modules, and [Table 8](#) gives additional information about handling the replacement of individual modules.

### **Practical Execution**

Before replacing the faulty I/O module:

1. Refer to *S800 I/O Getting Started (3BSE020923\*)*.
2. As special restrictions apply to each module type, see the descriptions in [Table 8](#) for useful information on individual module types.
3. Check if the new module can be a suitable replacement.

To replace the module:

1. Switch off the power to the I/O station.
2. Remove the power supply connector from the I/O module.
3. Remove the process connector from the I/O module.
4. Loosen the module locking.
5. Slide the module to the right and extract the module.
6. Insert the new module.
7. Store extracted modules in envelopes.
8. Ensure that the module contacts connect properly with the module to the left, and lock the module with the locking screw.
9. Switch on the power to the I/O station.
10. Connect the power supply to the I/O module.
11. Connect the process connector to the I/O module.

The new module is automatically initialized by the system, and the color of the S(tatus) LED turns from red to off, and then to green indicating that the module is in normal operation.

12. Perform a function test on the new module.

### Additional Information for Replacement of Individual S800L I/O Modules

[Table 8](#) lists S800L I/O modules and provides additional information for replacement of the modules.

*Table 8. Replacement information for S800L I/O Modules*

Module Type	Settings	Comments
AI801, DI801, DI802, DI803	No settings	Switch the power off before replacement.
AO801, DO801, DO802	No settings	Switch the power off before replacement. It may be necessary to set the process device manually to a safe state before the the power switch off.
TU805	No settings	Can be replaced with power applied. It may be necessary to set the process device manually to a safe state before replacing the TU805.





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# Appendix A Specifications

## General S800 I/O Specifications

### Features

The following are the general features of S800 I/O modules:

- 16/8/4/2 channels per I/O module.
- Isolation from ground, per channel or group of channels.
- Hot swappable (not valid for S800L).
- Module status LEDs.
- Input/output state LEDs (digital I/O modules only).
- Output Set to Predetermined function (output modules only).
- EMC protection.
- DIN rail mounting.
- G3 compliant.

### Description

There are two types of S800 I/O modules:

- Standard S800 I/O, which is mounted on MTU's.
- S800L, which is mounted directly on the DIN-rail.

The two types of S800 I/O modules can co-exist on the same bus. The main difference is that the standard S800 I/O is hot swappable, and it offers many type of field connection alternatives through the different type of MTUs that are used.

On the front of all standard S800 I/O modules, there are at least three LEDs (RUN, WARNING and FAULT) indicating the module status. Additionally output I/O modules have one LED indicating OSP (Output Set to Predetermined) and some input modules have one LED indicating PRIMARY. Digital I/O modules have one LED per channel indicating the current state (on/off) and pulse counter I/O modules have two or more LEDs per channel. S800L I/O module has one dual color LED (STATUS) indicating the module status.

All I/O modules have user parameters that can be configured using the engineering tool.

The reset circuitry keeps the I/O module in Init State until the bus master indicates that the Modulebus power supply is valid. In addition, the standard S800 I/O modules are kept in Init State until the module locking mechanism (on the MTU) is in the locked position.

All output I/O modules implement the Output Set to Predetermined (OSP) function. The outputs of the I/O module are set to a predetermined value, if the OSP-watchdog timer expires or if the `SetOSPState` command is received.

The watchdog timer is set by the controller (OSP timer) and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct node address is decoded (or broadcast). If the watchdog timer expires or if the `SetOSPState` command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values. The OSP value can be either configured as a predefined value or set to use the last good value sent.

The output values are kept as long as the module stays in the OSP state. To change the outputs, the module first has to leave this state. When re-entering Operational State, the outputs are still kept with their OSP value until new valid values are written.

## Technical Data

*Table 9. Technical data of S800 I/O modules*

Feature	Data
G3 compliant <sup>(1)</sup>	According to ISA-S71.04
Maximum ambient temperature	55/40°C (131/104°F) <sup>(2)</sup>
Equipment class	Class I according to IEC 61140 (earth protected)
Protection rating	IP20 according to IEC 60529
Width	S800: 45 mm (1.77") S800L: 86.1 mm (3.4")
Depth	S800: 102 mm (3.8"), 111 mm (4.2") including connector S800L: 58.5 mm (2.3")
Height	S800: 119 mm (4.7") S800L: 110 mm (4.33")
Weight	S800: 0.2 kg (0.44 lbs.) S800L: 0.24 kg (0.53 lbs.)

(1) Following S800 units are G2 compliant - SD821, SD822, SD823, SD831, SD832, SD833, SD834, SS822, SS832, TB811 and CI830. G3 compliant versions of SD822 and SS822 are also available (refer to SD822Z and SS822Z).

(2) 40°C (104°F) applies to compact MTUs with I/O modules or S800L modules mounted on vertical DIN rail.

## AI801 Analog Input Module, 0(4)...20 mA

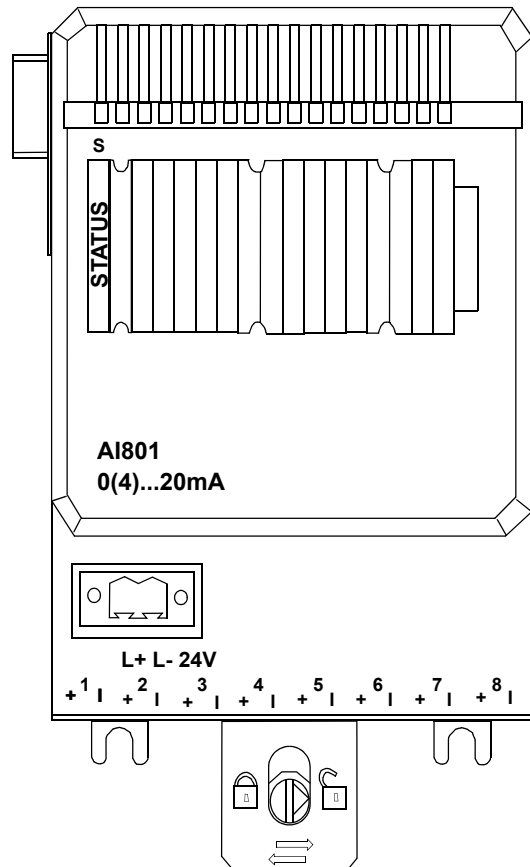
### Features

- 8 channels for 0...20 mA, 4...20 mA d.c., single ended unipolar inputs.
- 1 group of 8 channels isolated from ground.
- 12 Bit resolution.
- Input shunt resistors protected to 30 V by PTC resistor.
- Analog inputs are short circuit secured to ZP or +24 V.
- The input withstand HART communication.
- Process and power connections via detachable connectors.

### Description

The AI801 Analog Input Module has 8 channels for current input.

The current input is able to handle a short circuit to the transmitter supply at least 30 V d.c without damage. Current limiting is performed with a PTC resistor. The input resistance of the current input is 250 ohm, PTC included.



The module distributes the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2-wire transmitters. There are no current limiting on the transmitter power terminals. All eight channels are isolated from the ModuleBus in one group. Power to the input stages is converted from the external 24 V.

### Technical Data

Table 10. AI801 Analog Input Module Specifications at 25°C

Feature	AI801 Analog Input Module
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA, 4... 20 mA <sup>(1)</sup>
Under/over range	-0% / +15%
Input impedance (at current input) (including PTC)	$\geq 230 \Omega$ , $\leq 270 \Omega$
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	30 V d.c.
NMRR, 50 Hz, 60 Hz	>40 dB
Error	Max. 0.1%
Resolution	12 bit
Temperature drift	Typ. 50 ppm/°C Max. 80 ppm/°C
Update cycle time	1 ms
Current consumption 24 V (process power supply, UPx)	30 mA
Current consumption 5 V (Modulebus)	70 mA
Power dissipation	1.1 W

Table 10. AI801 Analog Input Module Specifications at 25°C (Continued)

Feature	AI801 Analog Input Module
Input filter cut off frequency Second order filter	3.5Hz
Input filter (rise time 0-90%)	140 ms
Isolation	Groupwise isolated from ground
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm <sup>2</sup> , 30-12 AWG Stranded: 0.05-1.5mm <sup>2</sup> , 30-12 AWG Recommended torque: 0.5-0.6Nm Stripping length: 6-7.5 mm, 0.24-0.30 in

(1) 4...20 mA handled by the FCI or controller

Block Diagram AI801

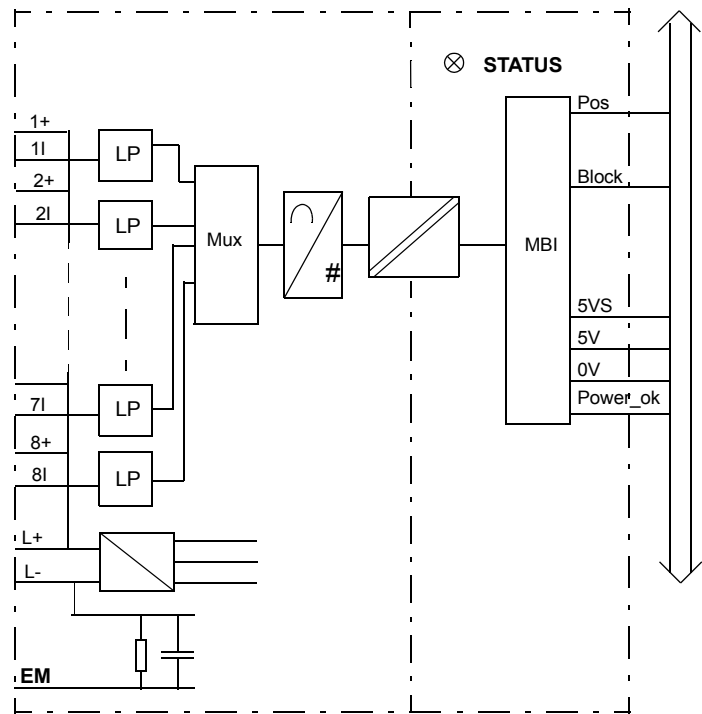


Figure 10. AI801 Block Diagram

**Process Connections***Table 11. AI801 Process Connections*

<b>Process Connection</b>	<b>Process Terminal</b>
Ch1, L1+	1+
Ch1, Current Input	1I
Ch 2, L1+	2+
Ch 2, Current Input	2I
Ch 3, L1+	3+
Ch 3, Current Input	3I
Ch 4, L1+	4+
Ch 4, Current Input	4I
Ch 5, L2+	5+
Ch 5, Current Input	5I
Ch 6, L2+	6+
Ch 6, Current Input	6I
Ch 7, L2+	7+
Ch 7, Current Input	7I
Ch 8, L2+	8+
Ch 8, Current Input	8I



Figure 11 shows the process connections for the AI801.

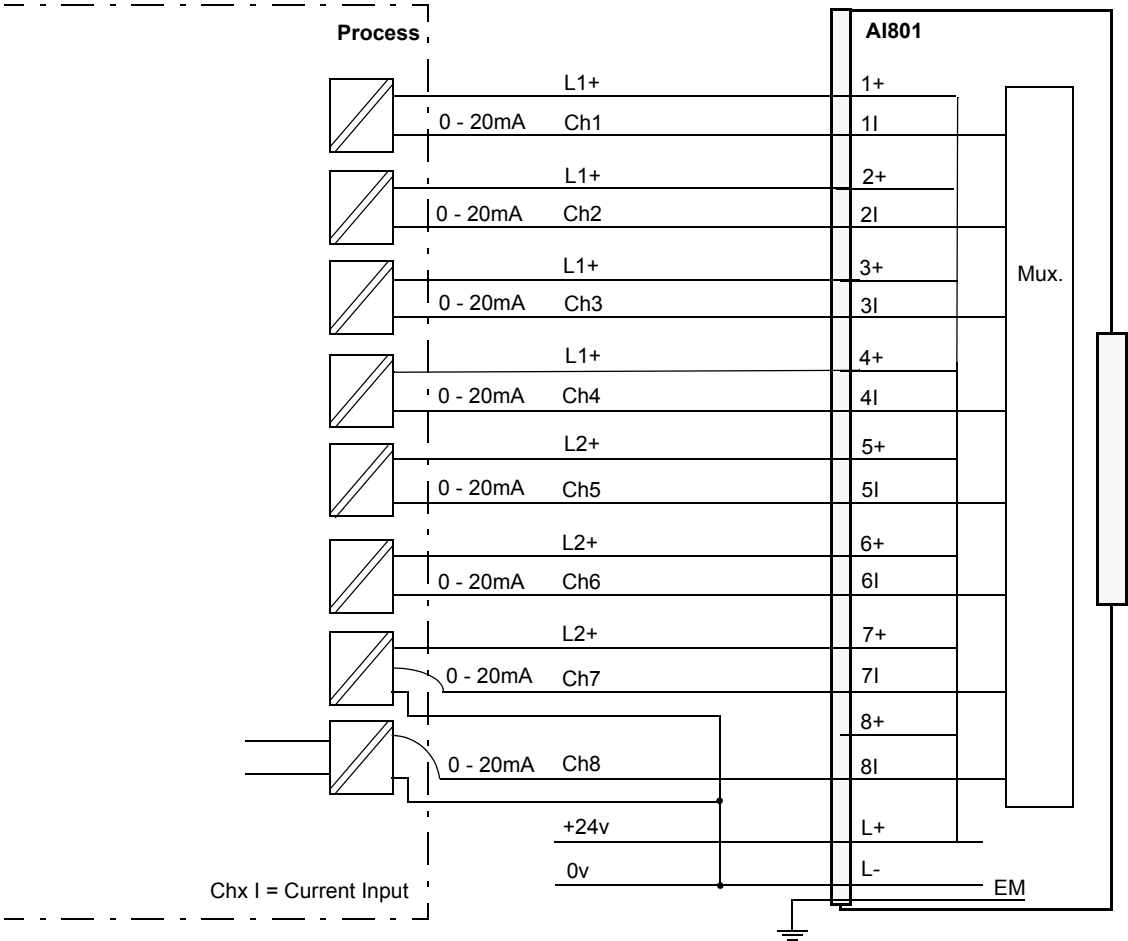


Figure 11. AI801 Process Connections

## AI810 Analog Input Module, 0(4)...20 mA, 0(2)...10 V

### Features

- 8 channels for 0...20 mA, 4...20 mA, 0...10 V or 2...10 V d.c., single ended unipolar inputs.
- 1 group of 8 channels isolated from ground.
- 12 Bit resolution.
- Input shunt resistors protected to 30 V by PTC resistor.
- Analog inputs are short circuit secured to ZP or +24 V.
- The input withstand HART communication.

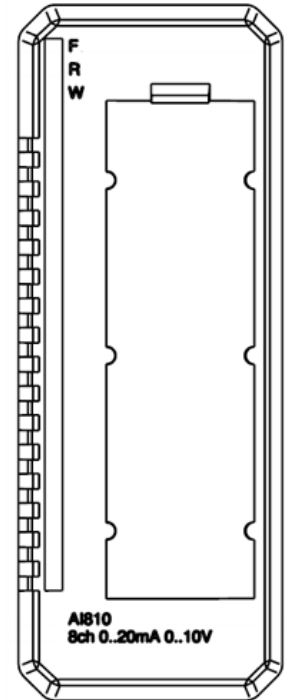
### Description

The AI810 Analog Input Module has 8 channels. Each channel can be either a voltage or current input.

The current input is able to handle a short circuit to the transmitter supply at least 30 V d.c without damage. Current limiting is performed with a PTC resistor. The input resistance of the current input is 250 ohm, PTC included.

The voltage input is able to withstand an over or undervoltage of at least 30 V d.c. Input resistance is 290k ohm.

Transmitter supply can be connected to L1+, L1- and/or L2+, L2-.



The module distributes the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2- or 3-wire transmitters. There are no current limiting on the transmitter power terminals. Fused MTUs TU830, TU835 and TU838 provides groupwise and channelwise fusing. TU850 provides channelwise current limitation on transmitter power terminals.

All eight channels are isolated from the ModuleBus in one group. Power to the input stages is converted from the 24 V on the ModuleBus.

Nine different types of MTUs can be used. The TU830/TU833 Extended MTU enables nine wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage inputs, but requires external terminals for distribution of 24 V power supply to the field devices. TU818 provides connection to 2-wire sensors without external marshaling. The extended MTU, TU835, and TU838 provides a fuse (3 A max.) per channel for the outgoing transmitter supply. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. TU850 provides one disconnectable PTC fused sensor/transmitter power outlet terminal per channel.

**Technical Data***Table 12. AI810 Analog Input Module Specifications at 25°C*

<b>Feature</b>	<b>AI810 Analog Input Module</b>
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA, 0...10 V, 4... 20 mA <sup>(1)</sup> , 2... 10 V <sup>(1)</sup>
Under/over range	-5% / +15%
Input impedance (voltage input)	290k ohm
Input impedance (current input)	230....275 ohm
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	30 V d.c.
NMRR, 50 Hz, 60 Hz	>40 dB
Error	Max. 0.1%
Resolution	12 bit
Temperature drift Current	Typ. 50 ppm/°C Max. 80 ppm/°C
Temperature drift Voltage	Typ. 70 ppm/°C Max. 100 ppm/°C
Update cycle time	8 ms
Current consumption 24 V (Modulebus)	40 mA
Current consumption 5 V (Modulebus)	70 mA
Power dissipation	1.5 W
Voltage supervision	Internal power supply
Fusing of transmitter supply	on MTU (TU830 max 1 AT per group)

*Table 12. AI810 Analog Input Module Specifications at 25°C (Continued)*

<b>Feature</b>	<b>AI810 Analog Input Module</b>
Sensor power distribution	Max 1 A per connection
Input filter (rise time 0-90%)	140 ms
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU835, TU838 or TU850
MTU keying code	AE
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Handled by the FCI or controller.

## Block Diagram AI810

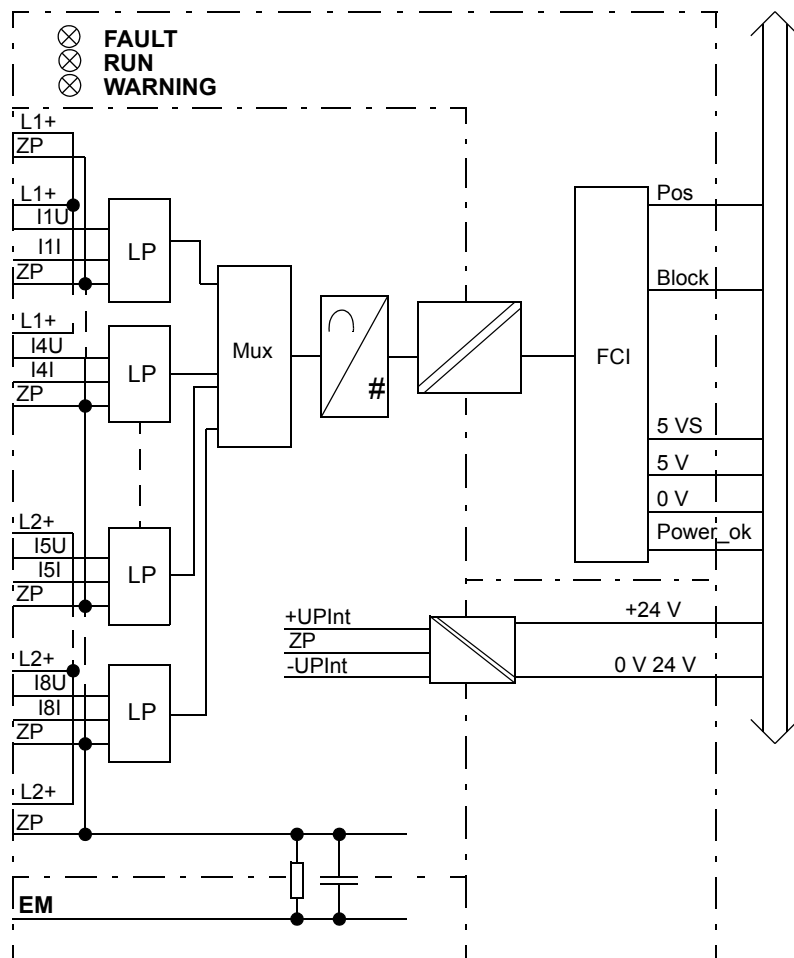


Figure 12. AI810 Block Diagram

**Process Connections***Table 13. AI810 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector (1)</b>	<b>TU818 Terminal</b>	<b>TU830/ TU833 Terminal</b>	<b>TU835 Terminal</b>	<b>TU838 Terminal</b>	<b>TU850 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1- (2)	L1- (2)
Ch1, L1+	-	-	C1, A1	B1, B2	11 (F1)	A1 (F1)	A1, A2
Ch1, Voltage Input	C1	3	D1	C1	-	B1	B1
Ch1, Current Input	B1	16	B1	C2	12	B2	B2
Ch1, Return (ZP)	A1	-	-	A1, A2	-	A2	-
Ch 2, L1+	-	-	C2, A2	B3, B4	21 (F2)	A3 (F2)	A3, A4
Ch 2, Voltage Input	C2	4	D2	C3	-	B3	B3
Ch 2, Current Input	B2	17	B2	C4	22	B4	B4
Ch 2, Return (ZP)	A2	-	-	A3, A4	-	A4	-
Ch 3, L1+	-	-	C3, A3	B5, B6	31 (F3)	A5 (F3)	A5, A6
Ch 3, Voltage Input	C3	5	D3	C5	-	B5	B5
Ch 3, Current Input	B3	18	B3	C6	32	B6	B6
Ch 3, Return (ZP)	A3	-	-	A5, A6	-	A6	-
Ch 4, L1+	-	-	C4, A4	B7, B8	41 (F4)	A7 (F4)	A7, A8
Ch 4, Voltage Input	C4	6	D4	C7	-	B7	B7
Ch 4, Current Input	B4	19	B4	C8	42	B8	B8
Ch 4, Return (ZP)	A4	-	-	A7, A8	-	A8	-
Ch 5, L2+	-	-	C5, A5	B9, B10	51 (F5)	A9 (F5)	A9, A10

Table 13. AI810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal	TU850 Terminal
Ch 5, Voltage Input	C5	7	D5	C9	-	B9	B9
Ch 5, Current Input	B5	20	B5	C10	52	B10	B10
Ch 5, Return (ZP)	A5	-	-	A9, A10	-	A10	-
Ch 6, L2+	-	-	C6, A6	B11, B12	61 (F6)	A11 (F6)	A11, A12
Ch 6, Voltage Input	C6	8	D6	C11	-	B11	B11
Ch 6, Current Input	B6	21	B6	C12	62	B12	B12
Ch 6, Return (ZP)	A6	-	-	A11, A12	-	A12	-
Ch 7, L2+	-	-	C7, A7	B13, B14	71 (F7)	A13 (F7)	A13, A14
Ch 7, Voltage Input	C7	9	D7	C13	-	B13	B13
Ch 7, Current Input	B7	22	B7	C14	72	B14	B14
Ch 7, Return (ZP)	A7	-		A13, A14	-	A14	-
Ch 8, L2+	-	-	C8, A8	B15, B16	81 (F8)	A15 (F8)	A15, A16
Ch 8, Voltage Input	C8	10	D8	C15	-	B15	B15
Ch 8, Current Input	B8	23	B8	C16	82	B16	B16
Ch 8, Return (ZP)	A8	-	-	A15, A16	-	A16	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)
0 V d.c. (ZP)	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.



Figure 13 shows the process connections for the Analog Input Module AI810 when installed on a TU830 Extended MTU.

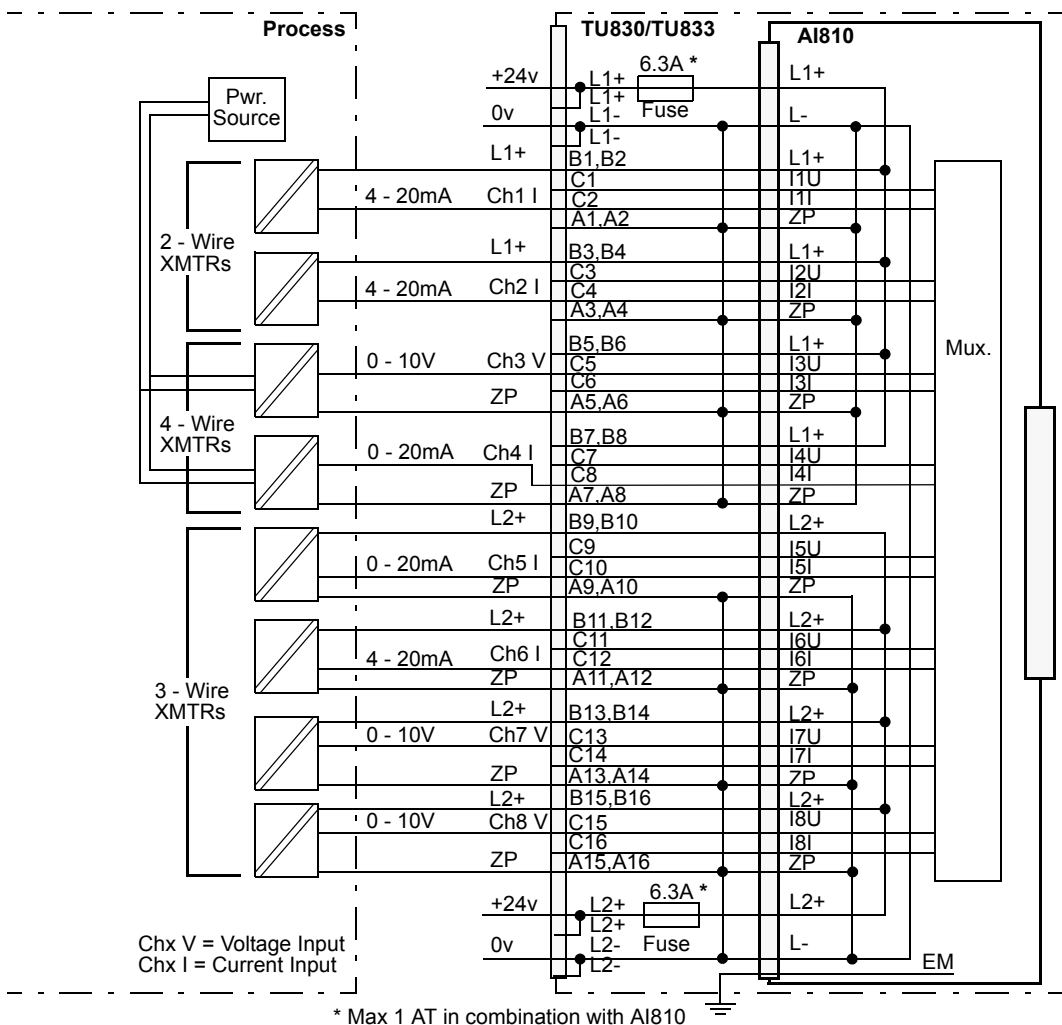


Figure 13. AI810 with TU830 Extended MTU Process Connections

Figure 14 shows the process connections for the AI810 when installed on a TU810 or TU814 Compact MTU.

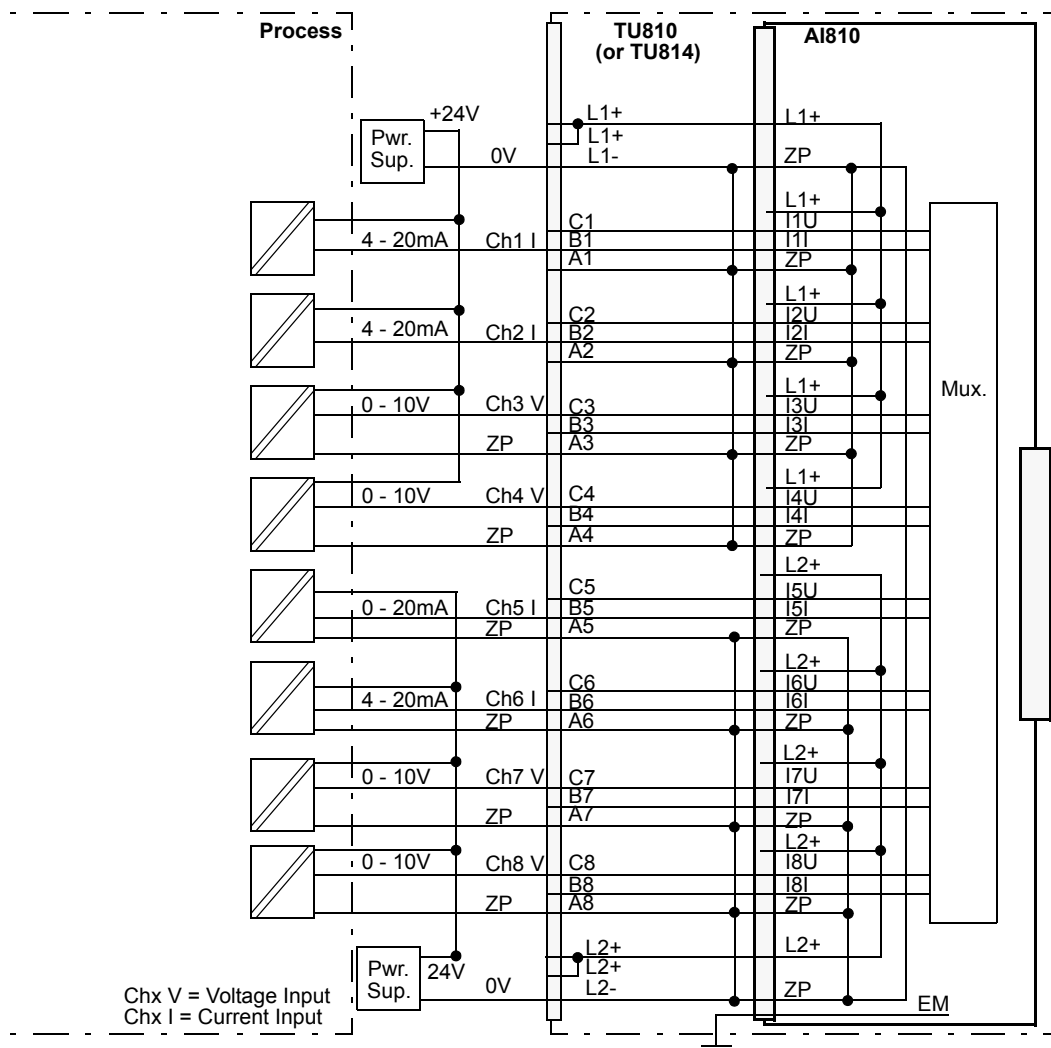


Figure 14. AI810 with TU810 or TU814 Compact MTU Process Connections

Figure 15 shows the process connections for the AI810 when installed on a TU835 Extended MTU.

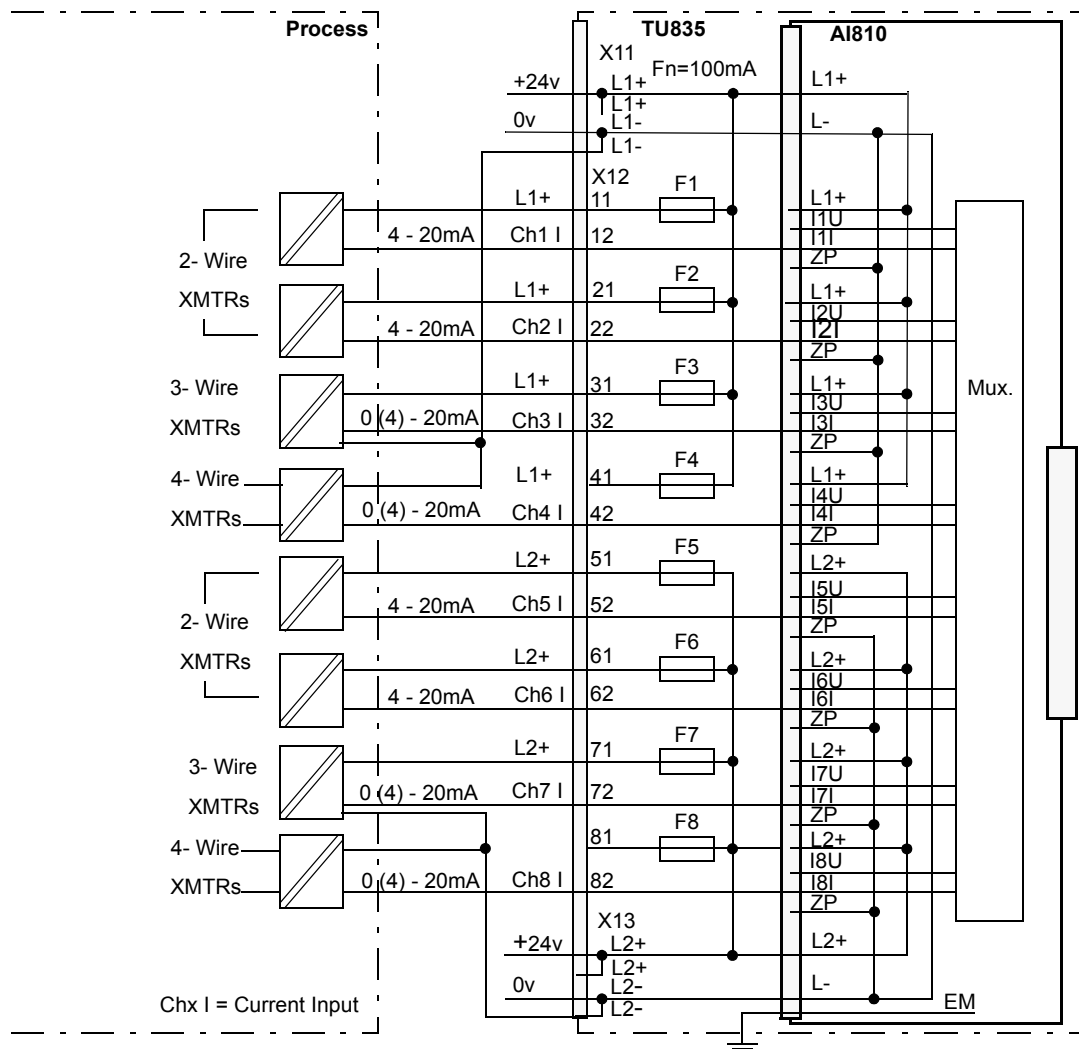


Figure 15. AI810 with TU835 Extended MTU Process Connections

Figure 16 shows the process connections for the AI810 when installed on a TU838 Extended MTU.

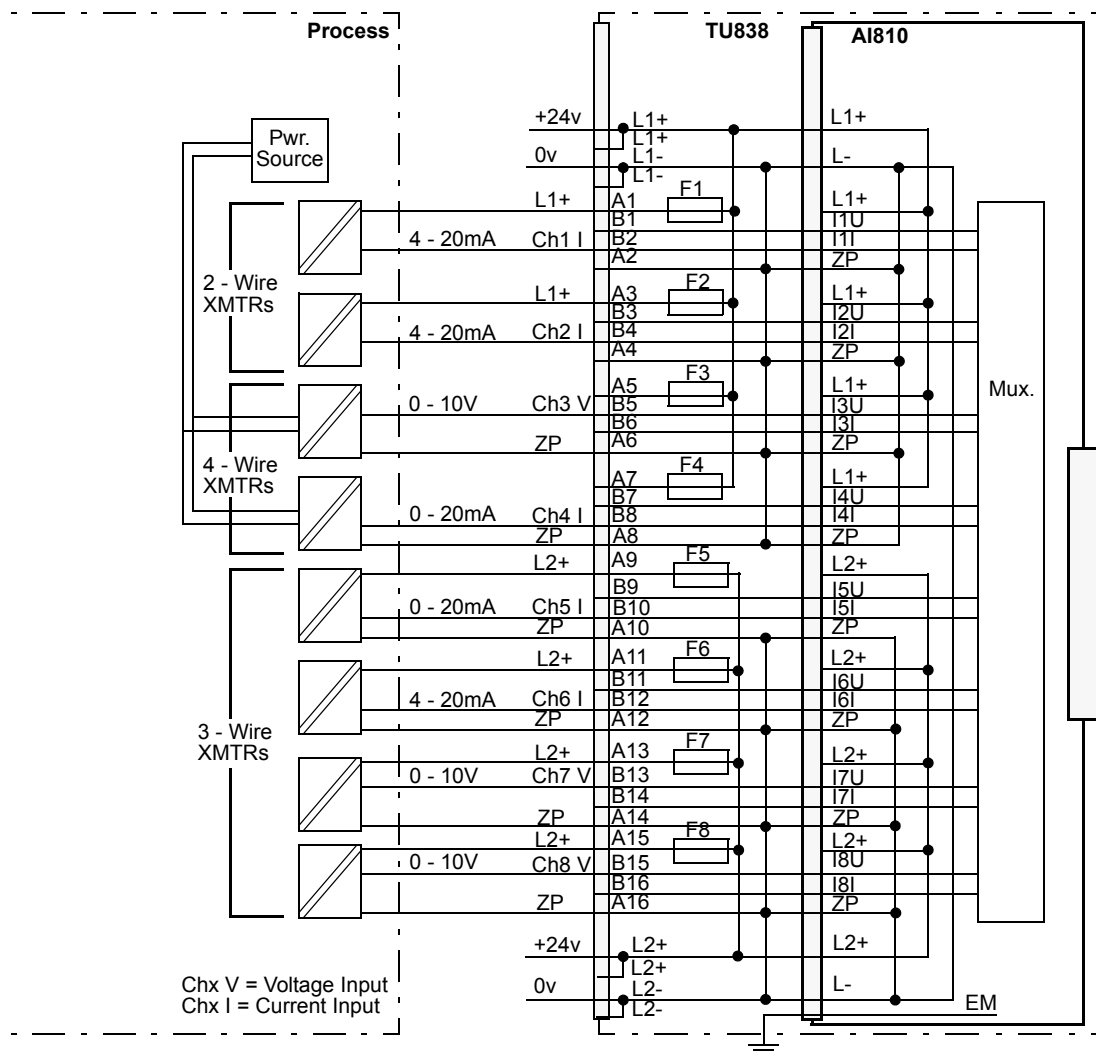


Figure 16. AI810 with TU838 Extended MTU Process Connections

Figure 17 shows the process connections for the AI810 when installed on a TU850 Extended MTU.

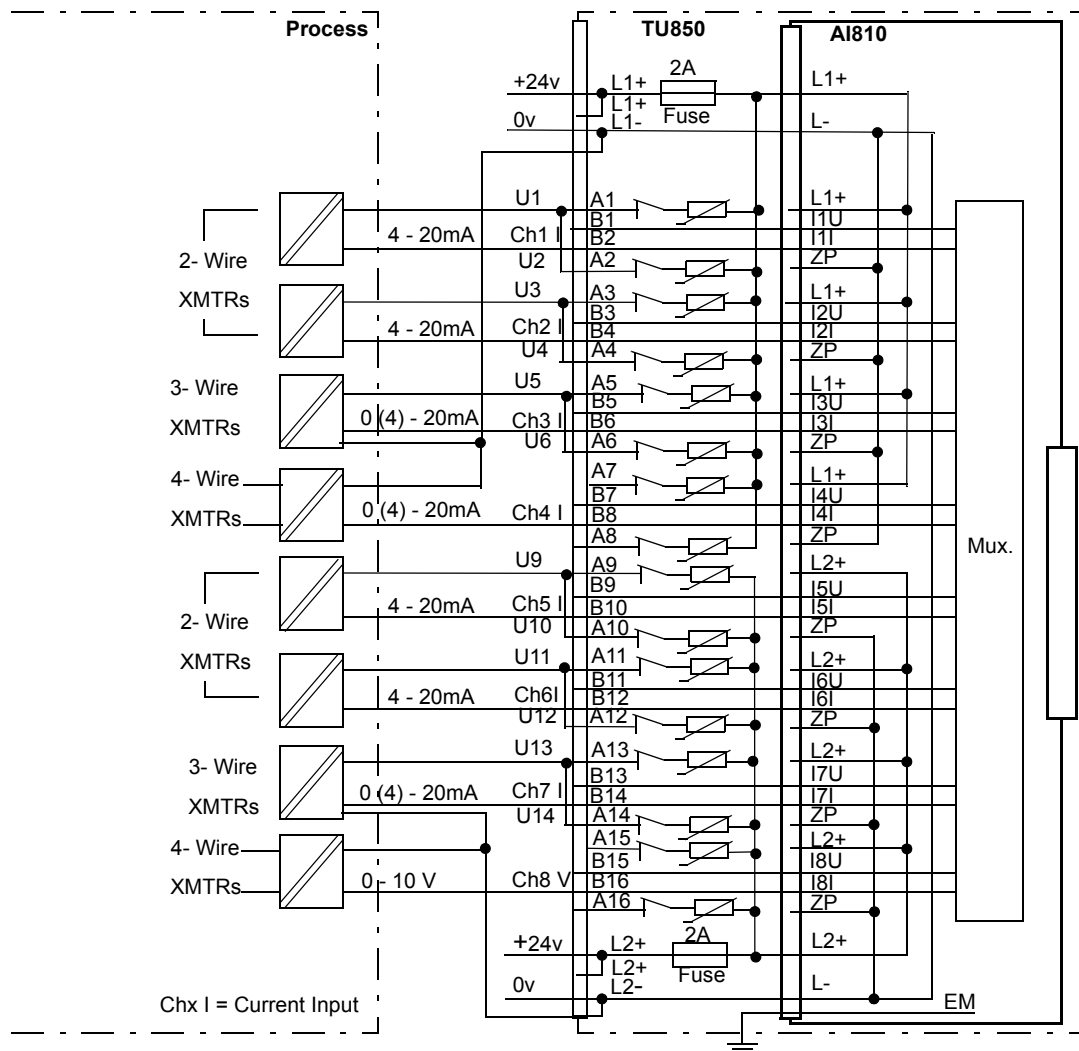


Figure 17. AI810 with TU850 Extended MTU Process Connections

Figure 18 shows the process connections for the AI810 when installed on a TU812 Compact MTU.

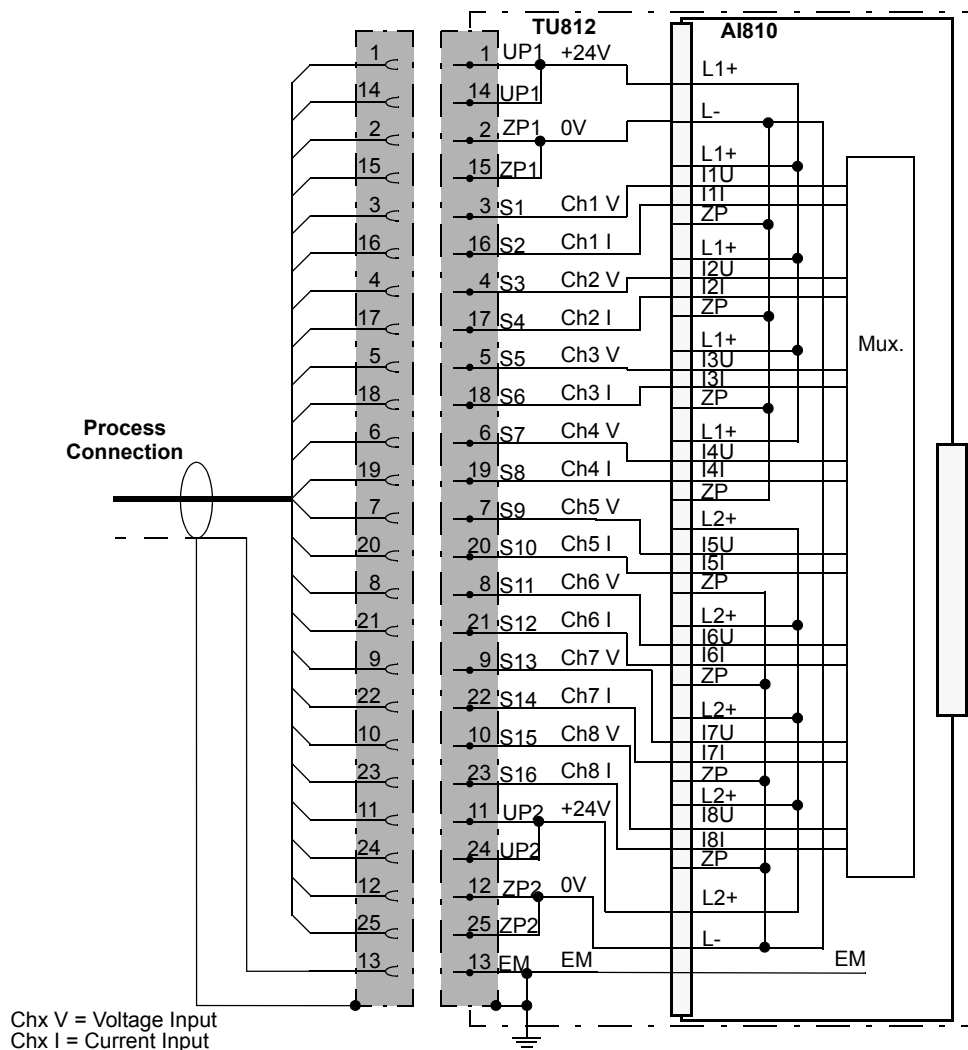


Figure 18. AI810 with TU812 Compact MTU Process Connections

Figure 19 shows the process connections for the Analog Input Module AI810 when installed on a TU818 Compact MTU.

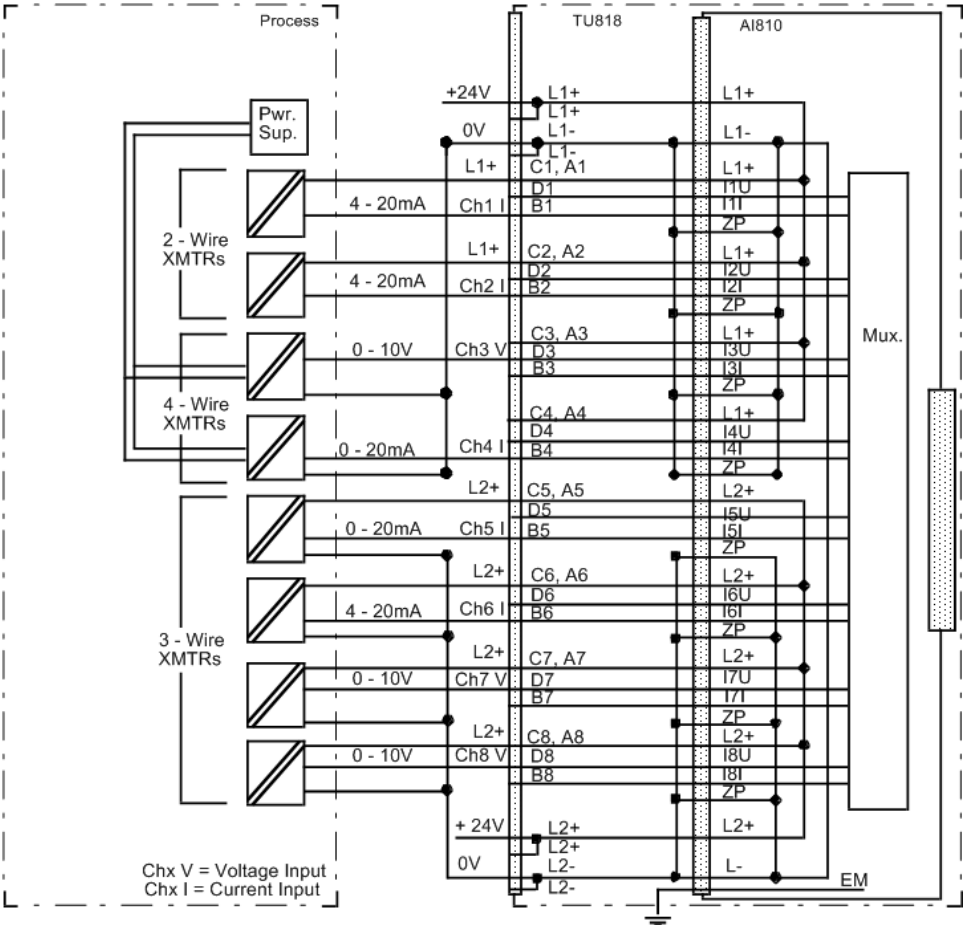


Figure 19. AI810 with TU818 Compact MTU Process Connections

## AI815 Analog Input Module

### Features

- 8 channels for 0...20 mA, 4...20 mA, 0...5 V or 1...5 V d.c., single ended unipolar inputs.
- 1 group of 8 channels isolated from ground.
- 12 Bit resolution.
- Current limited transmitter supply per channel.
- HART pass-through communication.

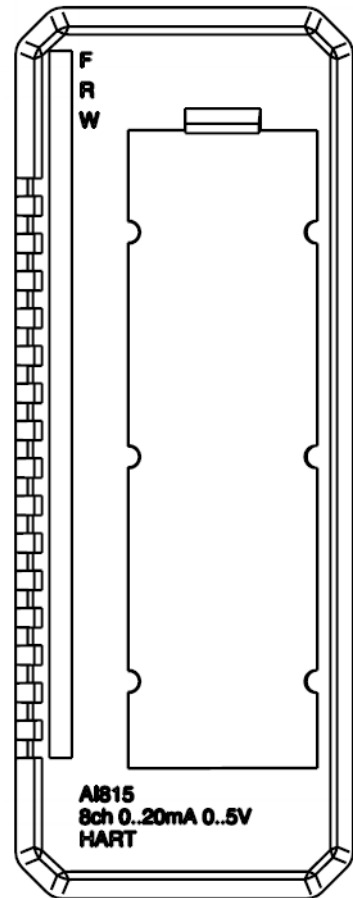
### Description

The AI815 Analog Input Module has 8 channels. The modules can be configured for voltage or current inputs. Current and voltage signals cannot be mixed on the same I/O module.

The voltage and current input is able to withstand an overvoltage or undervoltage of at least 11 V d.c. The input resistance for voltage input is greater than 10 M ohm, and the input resistance for current input is 250 ohm.

The module distributes the external HART compatible transmitter supply to each channel. This adds a simple connection to distribute the supply to 2-wire or 3-wire transmitters. The transmitter power is supervised and current limited.

If an external power supply is used for feeding HART transmitters, the power supply must be HART compatible.





The module performs self-diagnostic cyclically. Module diagnostics include:

- External power supply, Transmitter power and External shunt error. Error in these are reported as External channel error.
- Analog Read Back, Reference Voltage, Internal Power Supply, Checksum, Watchdog and Memory. Error in these are reported as Module Error.

All the eight channels are isolated from the ModuleBus in one group. The power to the input stages is converted from the 24 V supply on the ModuleBus.

The module has HART pass-through functionality. Only point-to-point communication is supported.

Eight different types of MTUs can be used. The TU830/TU833 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage inputs, but requires external terminals for distribution of 24 V power supply to the field devices. The extended MTU, TU835, and TU838 provides a fuse (3 A max) per channel for the outgoing transmitter supply. TU818 Compact MTU provides connection to 2-wire transmitters without external marshaling. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

Shielded field cables for process connections are required, if HART is used.

The parameter Shunt mode should be set to Internal shunt when current input is required and set to External shunt when voltage input is required.

**Technical Data***Table 14. AI815 Analog Input Module Specifications at 25°C*

<b>Feature</b>	<b>AI815 Analog Input Module</b>
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA, 0...5 V, 4... 20 mA, 1... 5V
Over range	+15%
Input impedance (at voltage input)	10 M $\Omega$
Input impedance (at current input) (including PTC)	250 $\Omega$
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	11 V d.c.
NMRR, 50 Hz, 60 Hz	> 40 dB
Error	Max. 0.1%
Resolution	12 bit
Temperature drift	Max. 50 ppm/°C
Update cycle time	10 ms
Current consumption 24 V (Modulebus)	50 mA
Current consumption 5 V (Modulebus)	100 mA
Current consumption 24 V (process power supply, UPx)	265 mA (max) (22 mA + transmitter current * 1.32)

Table 14. AI815 Analog Input Module Specifications at 25°C (Continued)

Feature	AI815 Analog Input Module
Power dissipation	3.5 W
Transmitter supply:	HART compatible Voltage: 24 V @ 23 mA Current: 30 mA + - 10% <sup>(1)</sup>
Supervision	Module error, if: analog read back, reference voltage, internal power supply, checksum, watchdog and memory error External channel error, if: external power supply low, transmitter power error
Input filter (rise time 0-90%)	290 ms
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU835 or TU838
MTU keying code	CC
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) If the transmitter need more current to start up, use external power for the transmitter

Block Diagram AI815

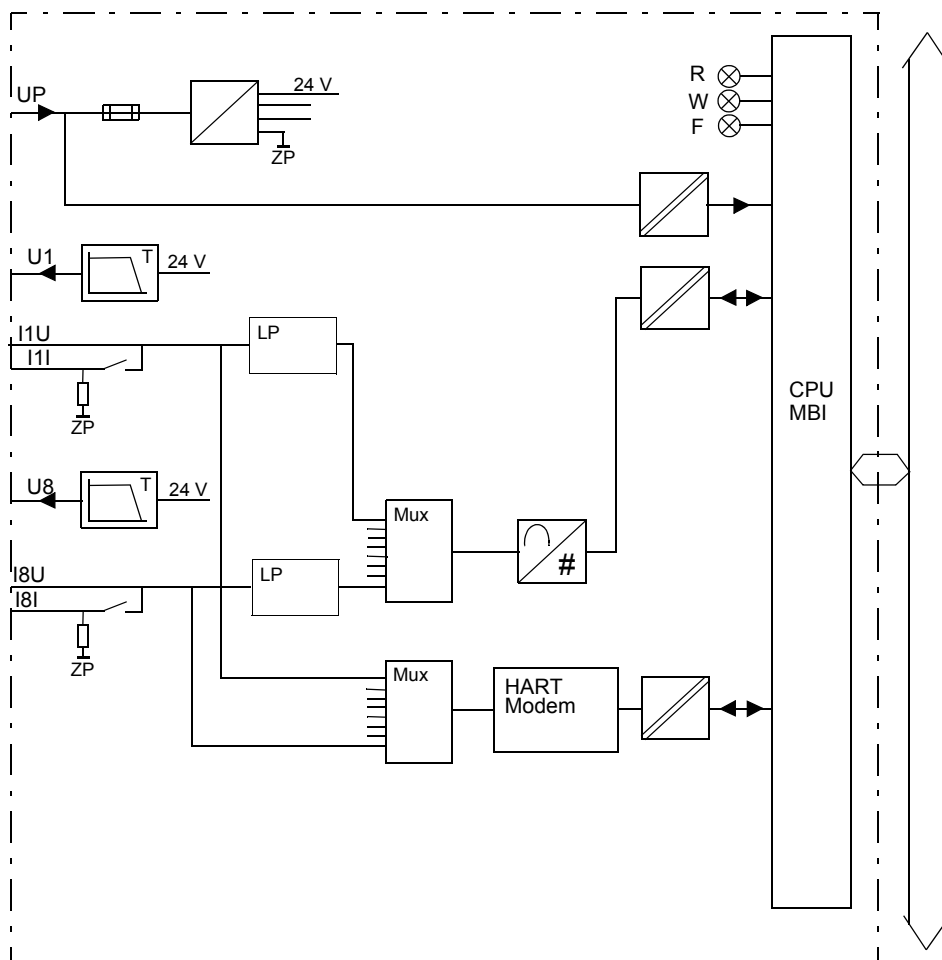


Figure 20. AI815 Block Diagram

### Process Connections

With HART signals, shielded cables should be used for current process connections.

Table 15. AI815 Process Connections

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU818 Terminal	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1- (2)
U1	-	-	C1	B1	11 (F1)	A1 (F1)
Ch1, Voltage Input	C1	3	D1	C1	-	B1
Ch1, Current Input	B1	16	B1	C2	12	B2
Ch1, Return (ZP)	A1	-	-	A1, A2	-	A2
U2	-	-	C2	B3	21 (F2)	A3 (F2)
Ch 2, Voltage Input	C2	4	D2	C3	-	B3
Ch 2, Current Input	B2	17	B2	C4	22	B4
Ch 2, Return (ZP)	A2	-	-	A3, A4	-	A4
U3	-	-	C3	B5	31 (F3)	A5 (F3)
Ch 3, Voltage Input	C3	5	D3	C5	-	B5
Ch 3, Current Input	B3	18	B3	C6	32	B6
Ch 3, Return (ZP)	A3	-	-	A5, A6	-	A6
U4	-	-	C4	B7	41 (F4)	A7 (F4)
Ch 4, Voltage Input	C4	6	D4	C7	-	B7
Ch 4, Current Input	B4	19	B4	C8	42	B8
Ch 4, Return (ZP)	A4	-	-	A7, A8	-	A8
U5	-	-	C5	B9	51 (F5)	A9 (F5)

Table 15. AI815 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal
Ch 5, Voltage Input	C5	7	D5	C9	-	B9
Ch 5, Current Input	B5	20	B5	C10	52	B10
Ch 5, Return (ZP)	A5	-	-	A9, A10	-	A10
U6	-	-	C6	B11	61 (F6)	A11 (F6)
Ch 6, Voltage Input	C6	8	D6	C11	-	B11
Ch 6, Current Input	B6	21	B6	C12	62	B12
Ch 6, Return (ZP)	A6	-	-	A11, A12	-	A12
U7	-	-	C7	B13	71 (F7)	A13 (F7)
Ch 7, Voltage Input	C7	9	D7	C13	-	B13
Ch 7, Current Input	B7	22	B7	C14	72	B14
Ch 7, Return (ZP)	A7	-		A13, A14	-	A14
U8	-	-	C8	B15	81 (F8)	A15 (F8)
Ch 8, Voltage Input	C8	10	D8	C15	-	B15
Ch 8, Current Input	B8	23	B8	C16	82	B16
Ch 8, Return (ZP)	A8	-	-	A15, A16	-	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)
0 V d.c. (ZP)	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 21 shows the process connections for the Analog Input Module AI815 when installed on a TU830/TU833 Extended MTU.

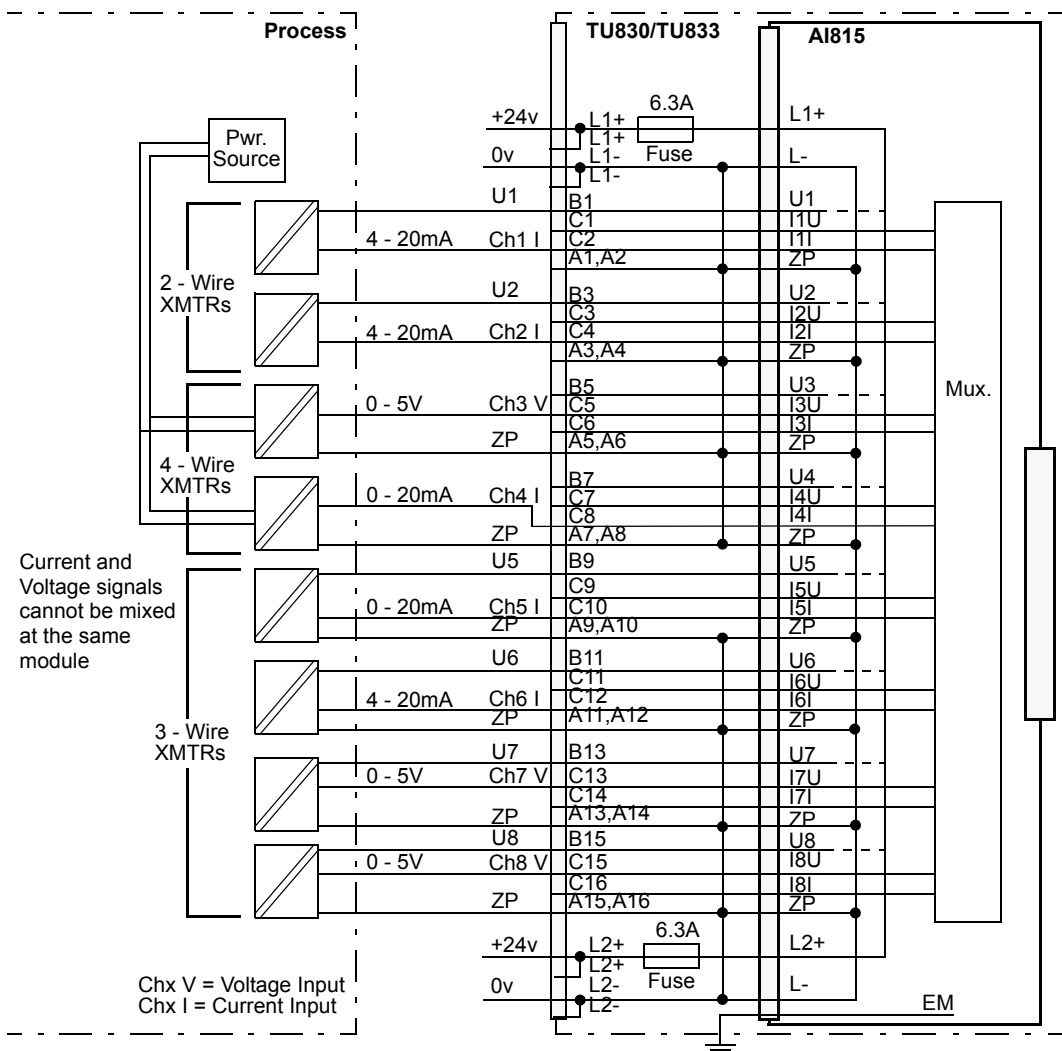


Figure 21. AI815 with TU830/TU833 Extended MTU Process Connections





Figure 23 shows the process connections for the Analog Input Module AI815 when installed on a TU838 Extended MTU.

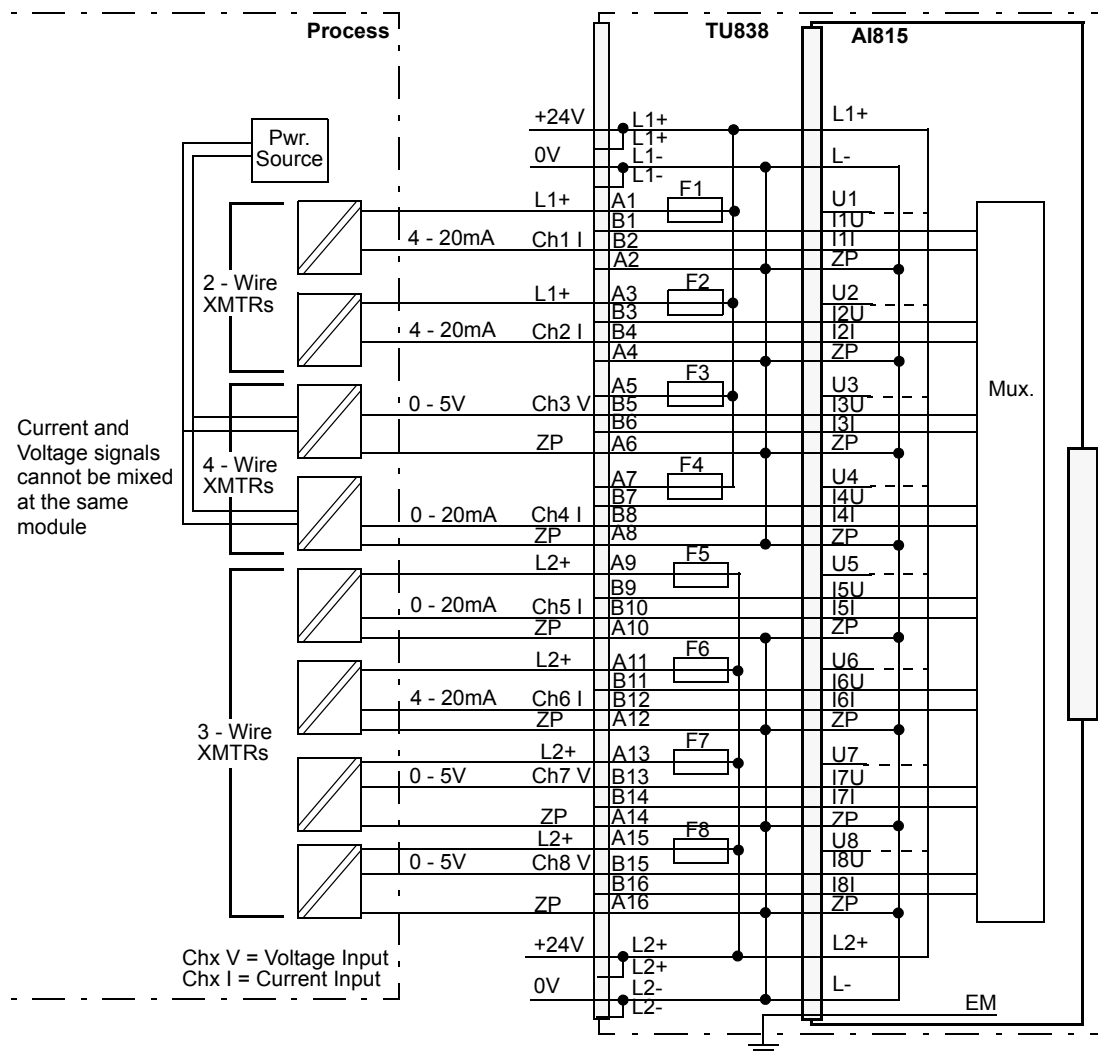


Figure 23. AI815 with TU838 Extended MTU Process Connections

Figure 24 shows the process connections for the Analog Input Module AI815 when installed on a TU810 or TU814 Compact MTU.

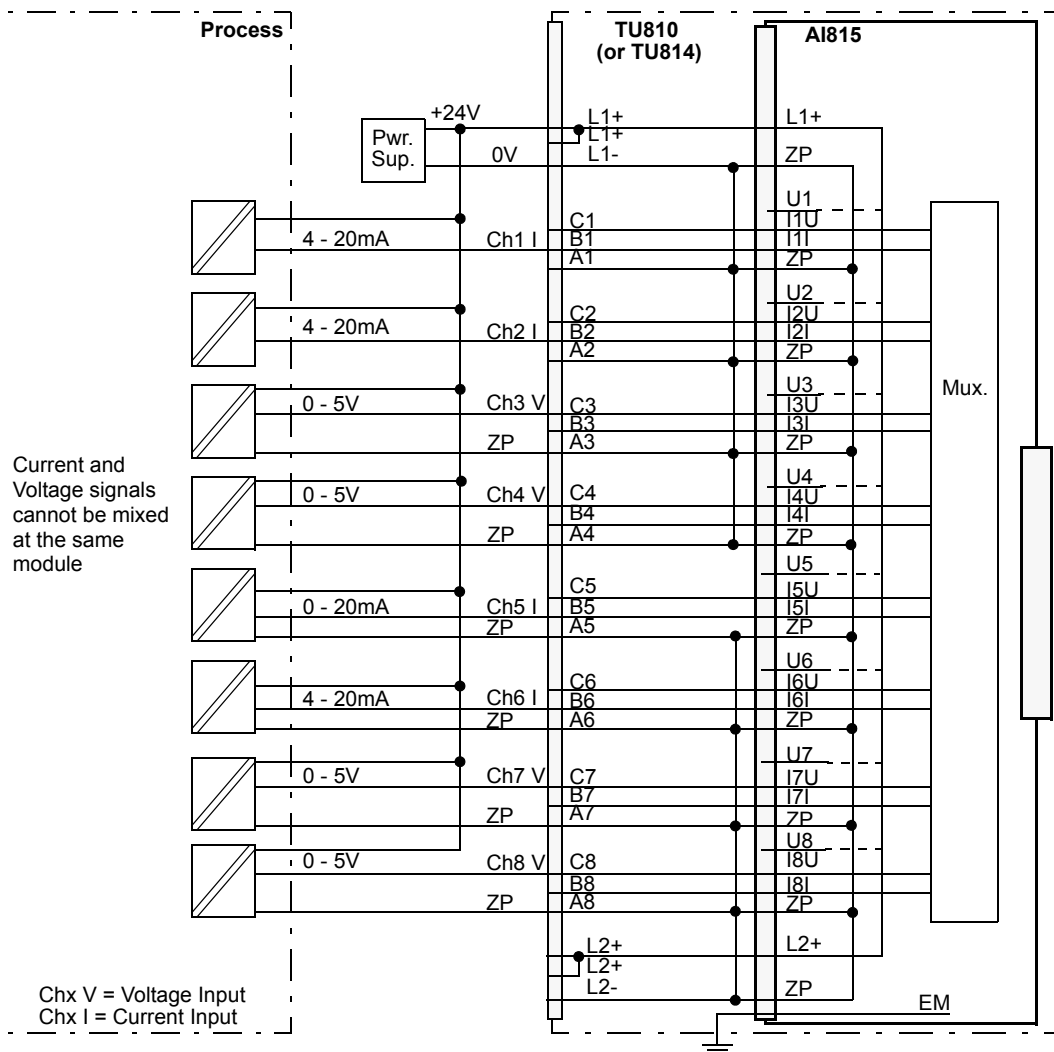


Figure 24. AI815 with TU810 or TU814 Compact MTU Process Connections

Figure 25 shows the process connections for the Analog Input Module AI815 when installed on a TU812 Compact MTU.

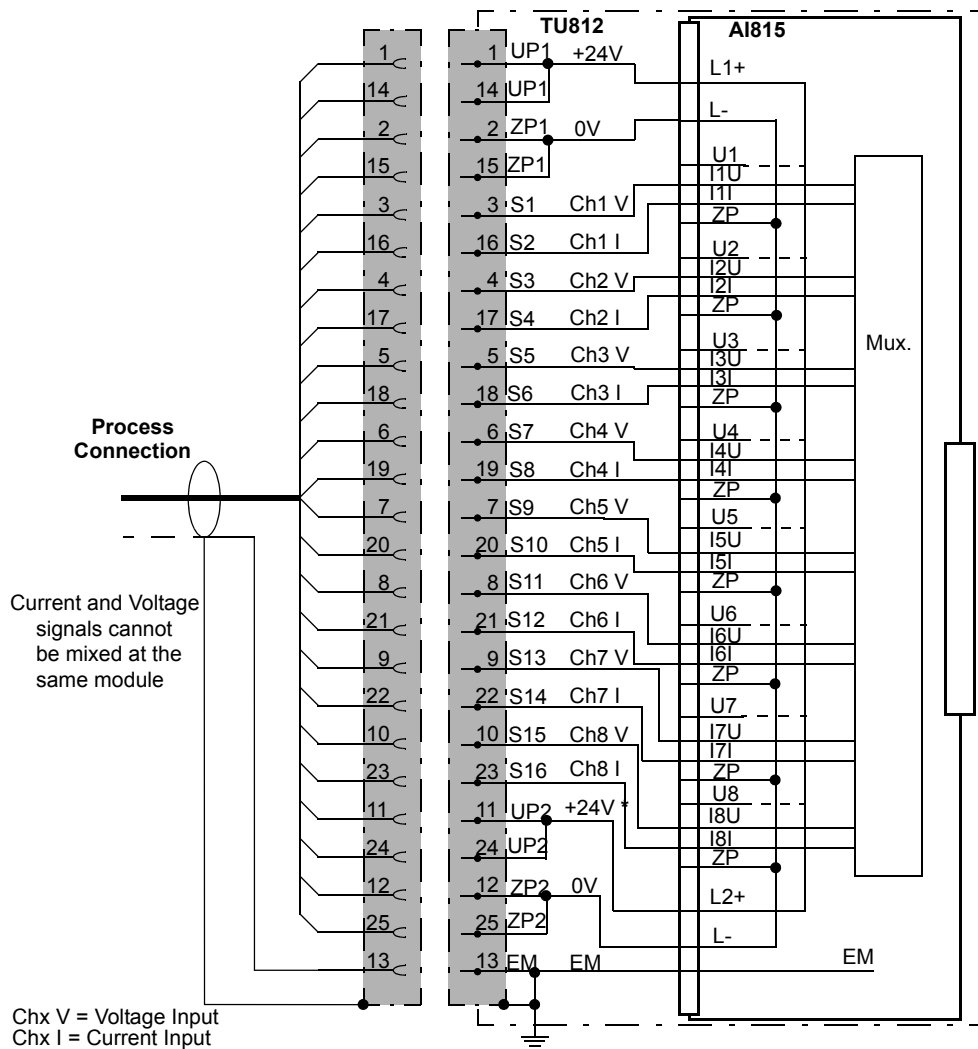


Figure 25. AI815 with TU812 Compact MTU Process Connections

Figure 26 shows the process connections for the Analog Input Module AI815 when installed on a TU818 Compact MTU.

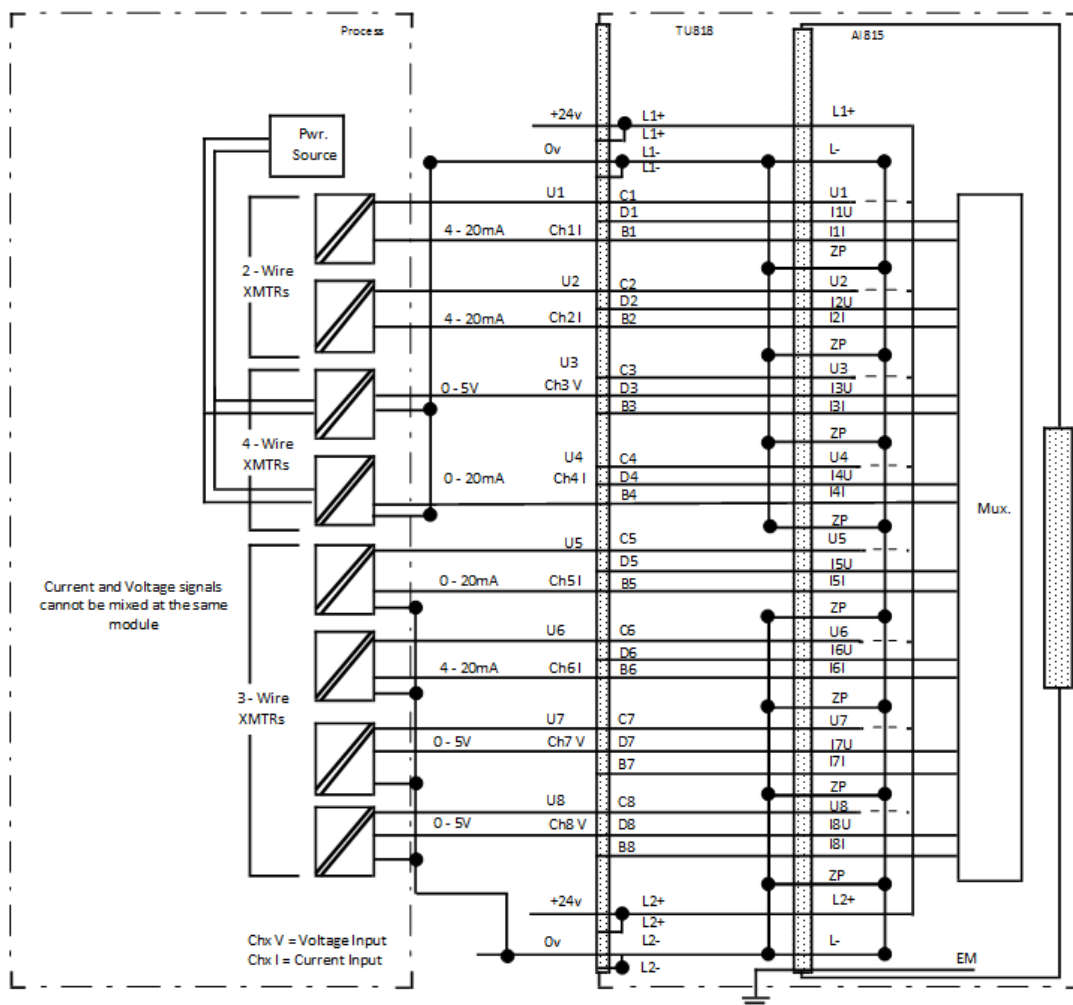


Figure 26. AI815 with TU818 Compact MTU Process Connections

## AI820 Differential Analog Input Module, +/- 20 mA, +/- 10 V, +/- 5 V (4...20 mA, 2...10 V, 1...5 V)

### Features

- 4 channels for -20...+20 mA, 0...20 mA, 4...20 mA, -10...+10 V, 0...10 V, 2...10 V, -5...+5 V, 0...5 V, 1...5 V d.c. bipolar differential inputs.
- One group of 4 channels isolated from ground.
- 14 Bit resolution plus sign.
- Input shunt resistors protected to 30 V d.c.
- The input withstand HART communication.

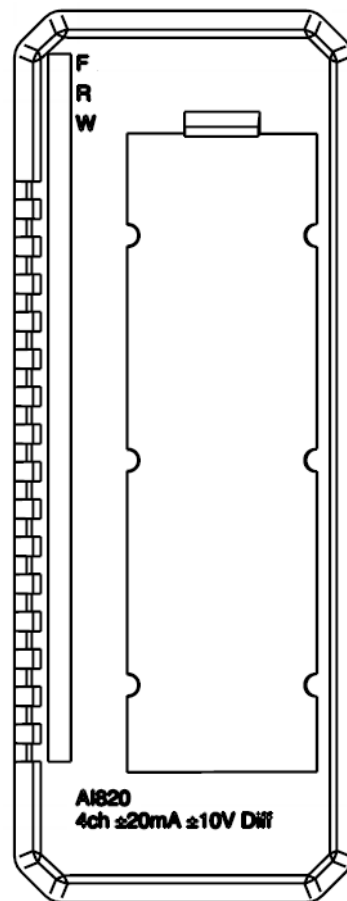
### Description

The AI820 Analog Input Module has 4 differential, bipolar current/voltage inputs. Each channel can be either a voltage or current input.

The current inputs can withstand an accidental maximum normal mode 30 V d.c. connection. To protect the current input circuit against dangerous input levels, that is, by accidentally connecting a 24 V source, the resistor rating of the 250 $\Omega$  current sense resistors is about 5 Watts. This is intended only to temporarily protect one channel at a time.

The module distributes the external transmitter supply to each channel. This adds a simple connection (with extended MTUs) to distribute the supply to external 2 wire transmitters. There is no current limiting on the transmitter power terminals.

All 4 channels are isolated from the ModuleBus in one group. Power to the input stages is converted from the 24 V on the ModuleBus.



Four different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage inputs, but requires external terminals for distribution of 24 V power supply to the field devices. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

## Technical Data

*Table 16. AI820 Differential Analog Input Module Specifications at 25°C*

Feature	AI820 Analog Input Module
Number of channels	4
Type of input	Bipolar differential
Measurement ranges (nominal)	-20...+20 mA, 0...20 mA, 4...20 mA <sup>(1)</sup> , -10...+10 V, 0...10 V, 2...10 V <sup>(1)</sup> , -5...+5 V, 0...5 V, 1...5 V <sup>(1)</sup> d.c.
Over/under range	± 15%
Input impedance (at voltage input)	200kΩ +/- 25% Common mode 800kΩ +/- 25% Normal mode
Input impedance (at current input)	250 Ω
Maximum field cable length	600 meters, (656 yd.)
Max. Differential d.c. input (Fault)	30 V
Common mode voltage input	50 V d.c.
CMRR, 50 Hz, 60 Hz	80 dB (>60 dB d.c.)
NMRR, 50 Hz, 60 Hz	33 dB
Error	Max. 0,1%
Resolution	14 bit plus sign

*Table 16. AI820 Differential Analog Input Module Specifications at 25°C  
(Continued)*

Feature	AI820 Analog Input Module
Temperature drift, Current	Max.50 ppm/°C
Temperature drift, Voltage	Max.70 ppm/°C
Update cycle time (all four channels)	<26 ms
Current consumption 24 V (Modulebus)	70 mA
Current consumption 5 V (Modulebus)	80 mA
Power dissipation	1.7W
Voltage supervision	Internal process supply
Input filter (rise time)	40 ms
Fusing of transmitter supply	on Extended MTU
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812, TU814 or TU830
MTU keying code	BB
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Handled by the FCI or controller.

### Block Diagram AI820

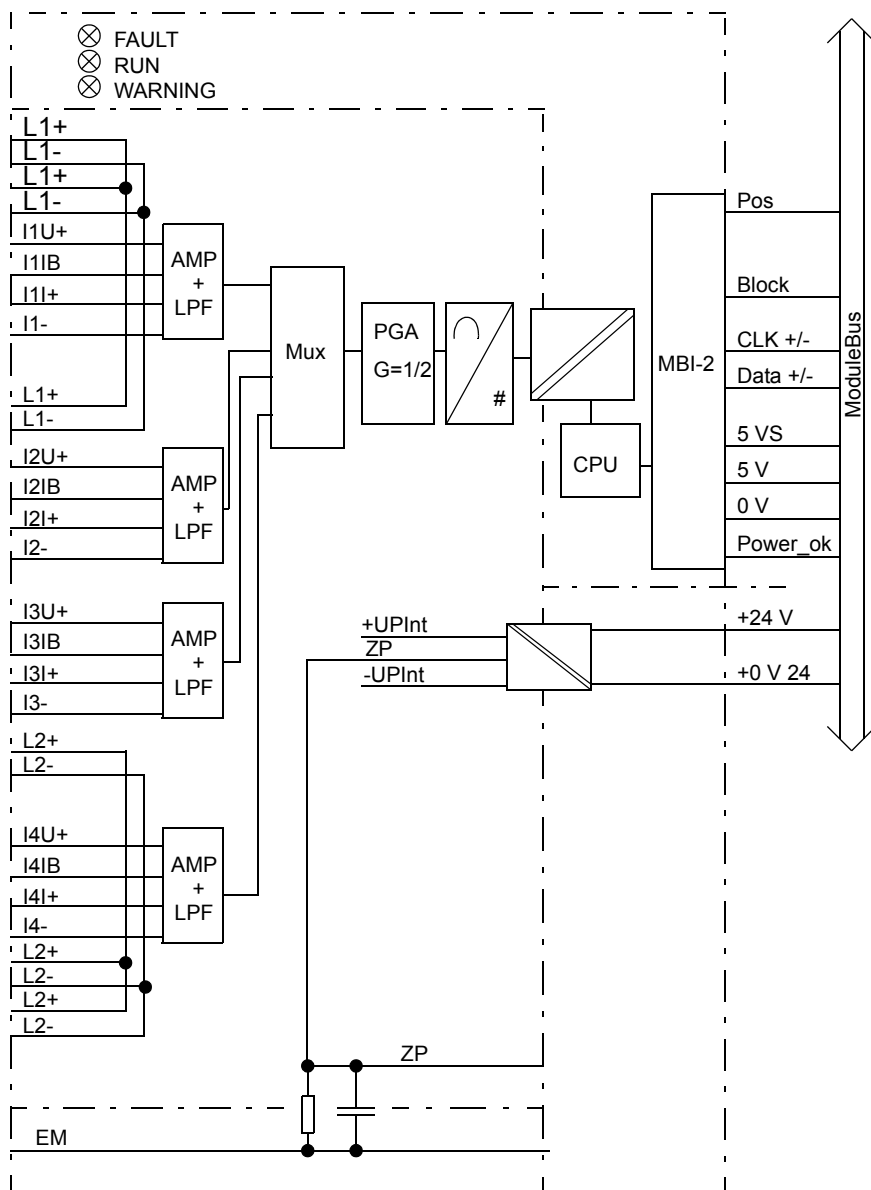


Figure 27. AI820 Block Diagram



**Process Connections***Table 17. AI820 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector<sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>
+24 V d.c.	L1+	1, 14	L1+
0 V d.c. (ZP)	L1-	2, 15	L1-
Ch1, L1+	-	-	B1, B2
Ch1V, Voltage Input +	C1	3	C1
Ch1IB <sup>(2)</sup>	B1	16	C2
Ch1, L1-	A1	-	A1, A2
Ch 1, L1+	-	-	B3, B4
Ch 1I, Current Input +	C2	4	C3
Ch 1-, Return - <sup>(2)</sup>	B2	17	C4
Ch 1, L1-	A2	-	A3, A4
Ch 2, L1+	-	-	B5, B6
Ch 2V, Voltage Input +	C3	5	C5
Ch 2IB <sup>(2)</sup>	B3	18	C6
Ch 2, L1-	A3	-	A5, A6
Ch 2, L1+	-	-	B7, B8
Ch 2I, Current Input +	C4	6	C7
Ch 2-, Return - <sup>(2)</sup>	B4	19	C8
Ch 2, L1-	A4	-	A7, A8
Ch 3, L2+	-	-	B9, B10
Ch 3V, Voltage Input +	C5	7	C9

Table 17. AI820 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal
Ch 3IB <sup>(2)</sup>	B5	20	C10
Ch 3, L2-	A5	-	A9, A10
Ch 3, L2+	-	-	B11, B12
Ch 3I, Current Input +	C6	8	C11
Ch 3-, Return - <sup>(2)</sup>	B6	21	C12
Ch 3, L2-	A6	-	A11, A12
Ch 4, L2+	-	-	B13, B14
Ch 4V, Voltage Input +	C7	9	C13
Ch 4IB <sup>(2)</sup>	B7	22	C14
Ch 4, L2-	A7	-	A13, A14
Ch 4, L2+	-	-	B15, B16
Ch 4I, Current Input +	C8	10	C15
Ch 4-, Return - <sup>(2)</sup>	B8	23	C16
Ch 4, L2-	A8	-	A15, A16
+24 V d.c.	L2+	11, 24	L2+
0 V d.c. (ZP)	L2-	12, 25	L2-

(1) Pin 13 connected to connector body for EM.

(2) When connect current signal current bridge must be connected to the voltage Input. If 2-wire transmitter also connect Return- to L1- or L2-.

Figure 28 shows the process connections for the Differential Analog Input Module AI820 when installed on a TU830 Extended MTU.

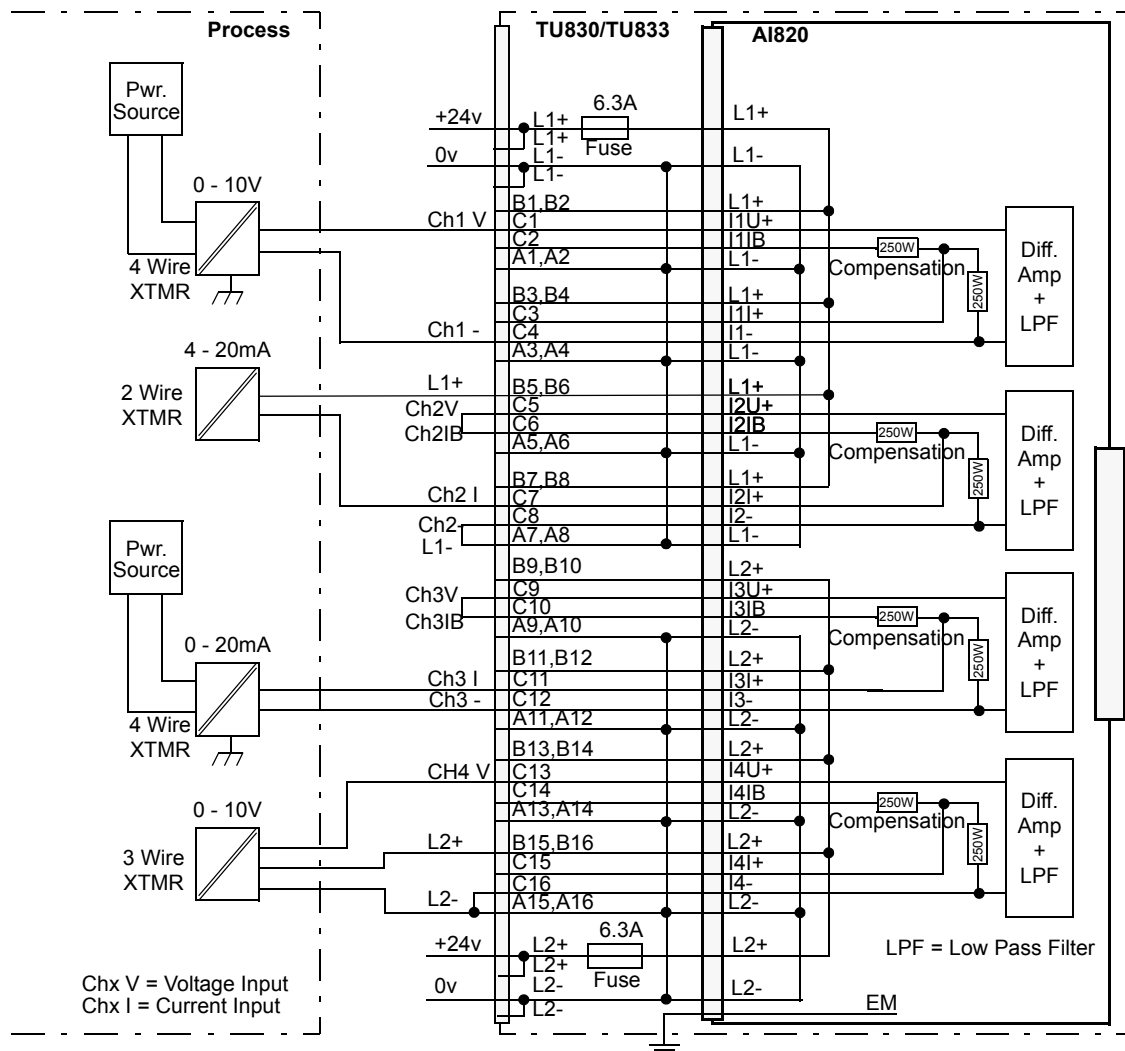


Figure 28. AI820 with TU830 Extended MTU Process Connections

Figure 29 shows the process connections for the AI820 when installed on a TU810 or TU814 Compact MTU.

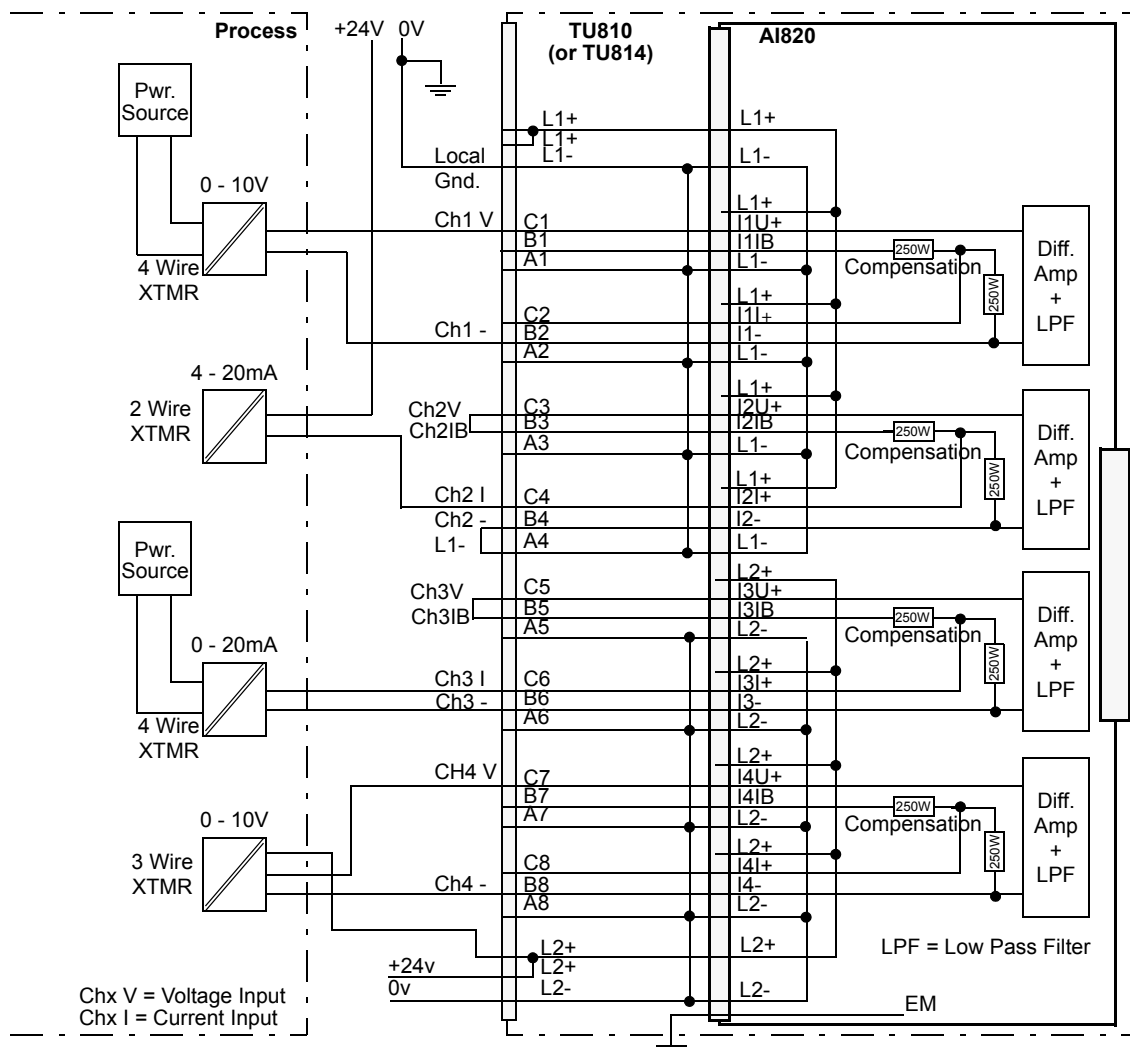


Figure 29. AI820 with TU810 or TU814 Compact MTU Process Connections

Figure 30 shows the process connections for the AI820 when installed on a TU812.

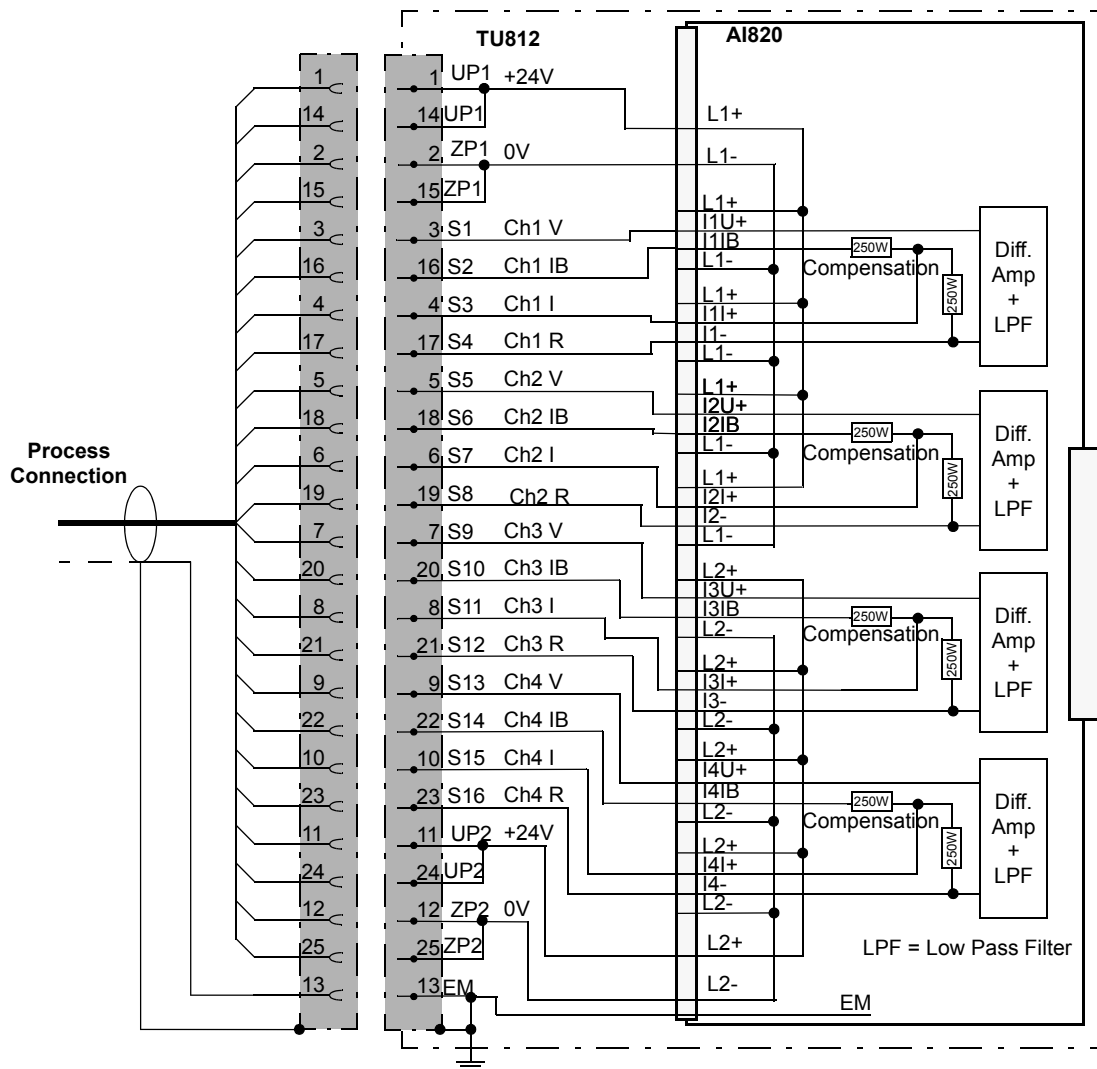


Figure 30. AI820 with TU812 Compact MTU Process Connections

## AI825 Galvanic Isolated Analog Input Module

### Features

- 4 channels individually galvanic isolated inputs for  $\pm 20$  mA, 0...20 mA, 4...20 mA,  $\pm 10$  V, 0...10 V, 2...10 V.
- 14 Bit resolution plus sign.
- Input shunt resistors protected to 30 V d.c.
- The input withstands HART communication.

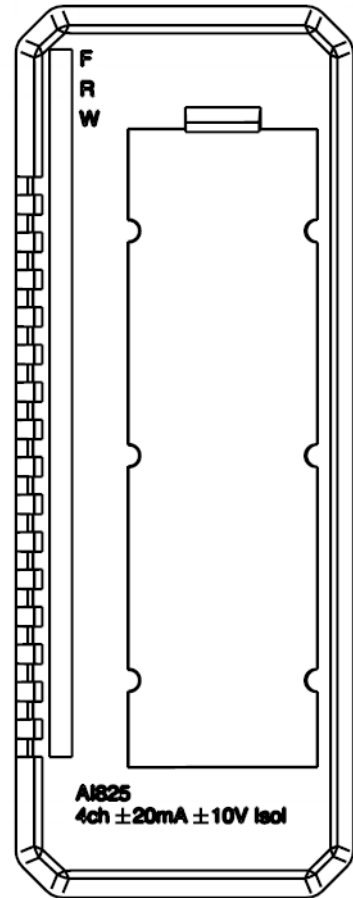
### Description

The AI825 Analog Input Module has 4 individually galvanic isolated, bipolar current/voltage inputs. Each channel can be either a voltage or current input.

The module has a direct current input that withstand up to 6.3 V and a over voltage protected current input that withstand up to +30 V d.c. The current is limited by a PTC resistor.

Power to the input stages is converted from the 24 V on the ModuleBus.

Three different types of MTUs can be used; TU831 Extended MTU, TU811 or TU813 Compact MTU. The TU813 Compact MTU has crimped snap-in connectors for connection to the process.



**Technical Data***Table 18. AI825 Galvanic Isolated Input Module Specifications at 25°C*

Feature	AI825 Analog Input Module
Number of channels	4
Type of input	Galvanic isolated channel to channel channel to ground
Measurement ranges (nominal)	-20...+20 mA, 0...20 mA, 4...20 mA, -10...+10 V, 0...10 V, 2...10 V d.c.
Over/under range	± 15%
Input impedance at voltage input (I x U)	10 MΩ
Input impedance at current input (I x I)	50 Ω
Over voltage protected current input (I x IP)	50 Ω + 125 Ω
Maximum field cable length	600 meters, (656 yd.)
Max. Differential d.c. input (Fault)	
Voltage input	30 V
Over voltage protected current input	30 V
Current input	6.3 V
CMRR, 50 Hz, 60 Hz	120 dB
NMRR	>40 dB at 50 Hz, >55 dB at 60 Hz
Error	Max. 0,1%
Resolution	14 bit plus sign
Temperature drift	Max 57 ppm/°C (± 20 mA) Max 34 ppm/°C (± 10 V) Max 78 ppm/°C (0...20 mA) Max 47 ppm/°C (0...10 V)

Table 18. AI825 Galvanic Isolated Input Module Specifications at 25°C (Continued)

Feature	AI825 Analog Input Module
Update cycle time (all four channels)	<10 ms
Current consumption 24 V (Modulebus)	Typ 90 mA, max 110 mA
Current consumption 5 V (Modulebus)	Typ 70 mA, max 100 mA
Power dissipation	Typ 2.5 W, max 3.2 W
Voltage supervision	Internal supplies
Input filter (0 to 90%)	130 ms at current input 115 ms at voltage input
Module termination units	TU811, TU813 or TU831
MTU keying code	DA
Rated insulation voltage	250 V
Dielectric test voltage between channels channel to ground and MB24V MB24V to ground	1900 V d.c. 3250 V d.c. 720 V d.c.



Block Diagram AI825

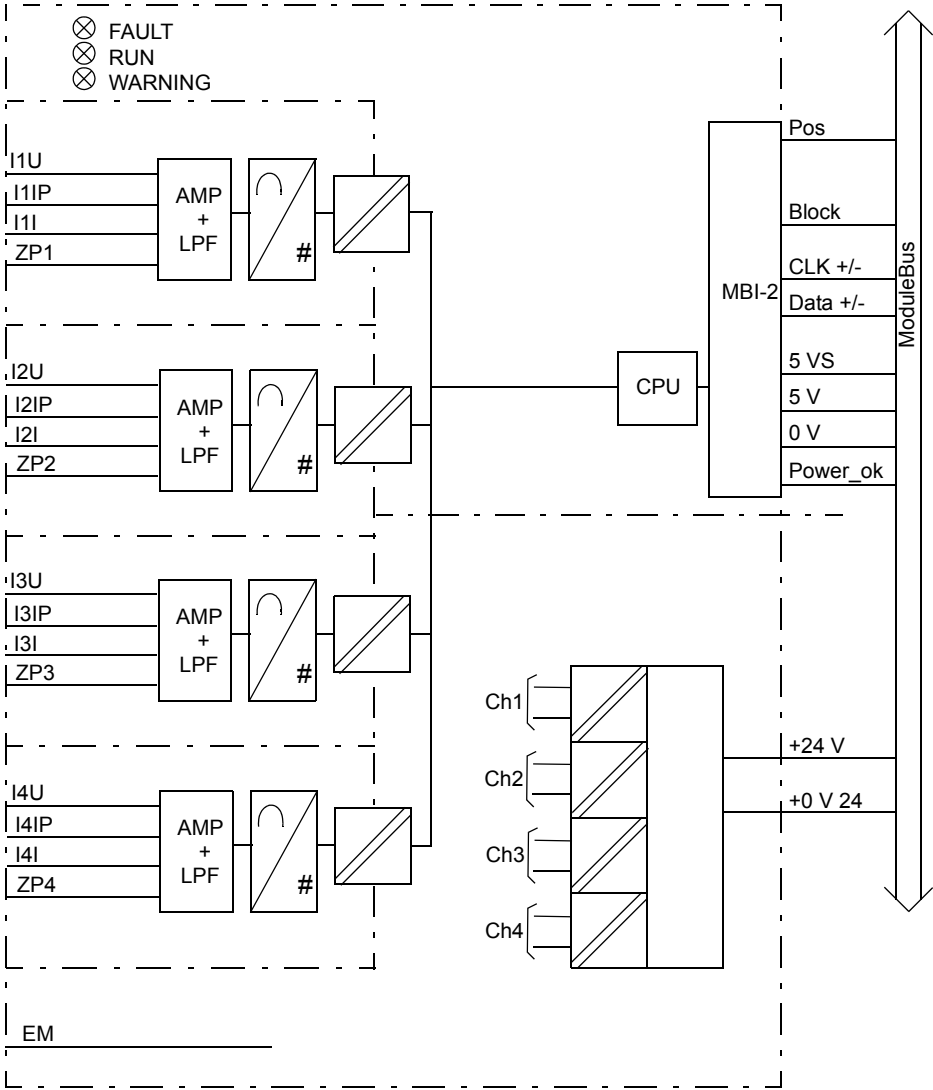


Figure 31. AI825 Block Diagram

**Process Connections***Table 19. AI825 Process Connections*

<b>Process Connection</b>	<b>TU811 or TU813 Terminal</b>	<b>TU831 Terminal</b>
Ch1V, Voltage Input +	B1	B1
Ch1 IP, Current input+ protected	C2	B2
Ch 1I, Current Input +	A2	A2
Ch 1-, Return - (ZP1)	A1	A1
Ch 2V, Voltage Input +	B3	B3
Ch2 IP, Current input+ protected	C4	B4
Ch 2I, Current Input +	A4	A4
Ch 2-, Return - (ZP2)	A3	A3
Ch 3V, Voltage Input +	B5	B5
Ch3 IP, Current input+ protected	C6	B6
Ch 3I, Current Input +	A6	A6
Ch 3-, Return - (ZP3)	A5	A5
Ch 4V, Voltage Input +	B7	B7
Ch4 IP, Current input+ protected	C8	B8
Ch 4I, Current Input +	A8	A8
Ch 4-, Return - (ZP4)	A7	A7

Figure 32 shows the process connections for the Galvanic Isolated Analog Input Module AI825 when installed on a TU811/TU811V1 or TU813 Compact MTU.

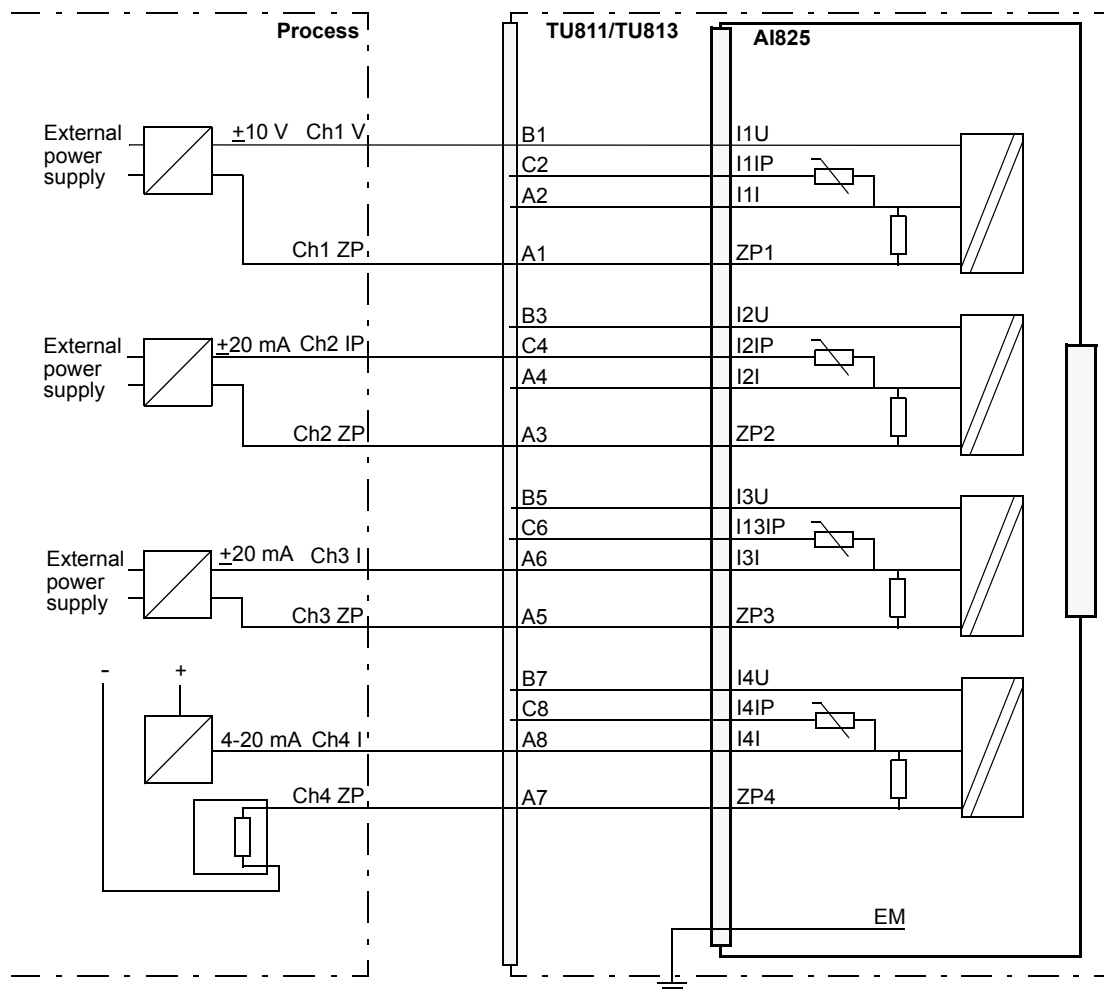


Figure 32. AI825 with TU811/TU811V1 or TU813 Compact MTU Process Connections

Figure 33 shows the process connections for the AI825 when installed on a TU831 Extended MTU.

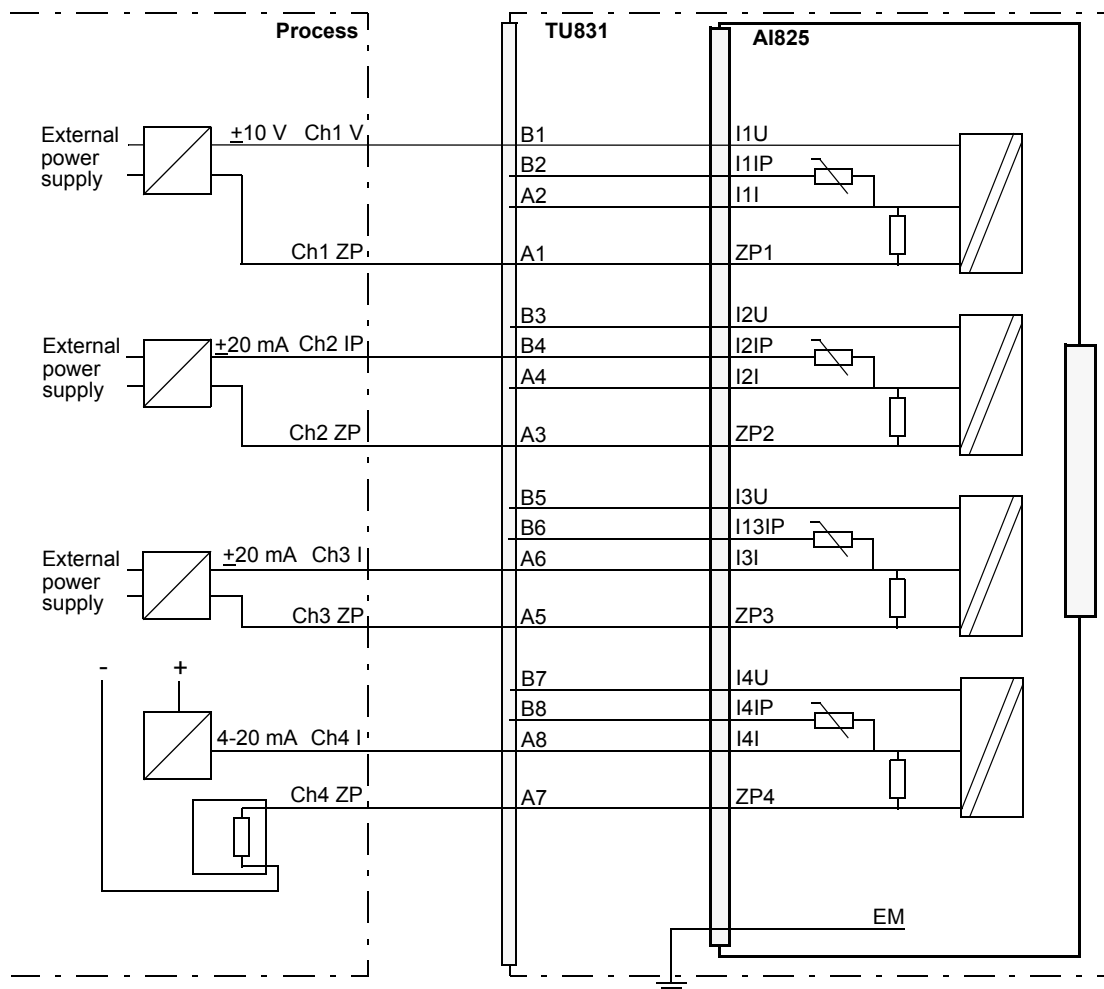


Figure 33. AI825 with TU831 Extended MTU Process Connections

## AI830/AI830A RTD Input Module

### Features

- 8 channels for RTD (Pt100, Cu10, Ni100 and Ni120 and resistor) inputs.
- 3-wire connection to RTDs.
- 14 Bit resolution.
- Inputs are monitored for open-circuit, short-circuit and has a input grounded sensor.

### Description

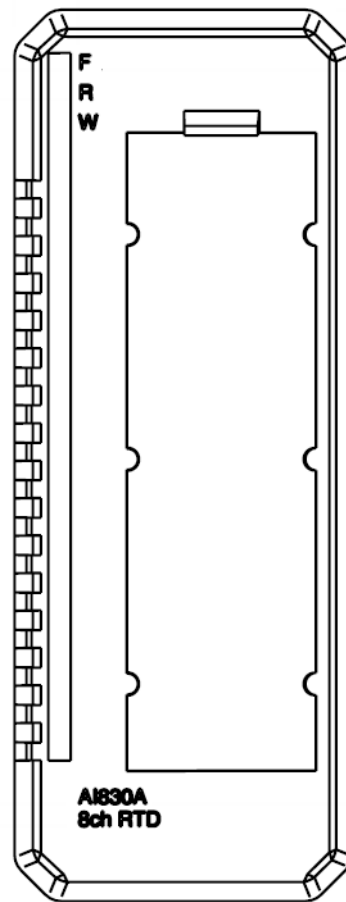
The AI830/AI830A RTD Input Module has 8 channels for measurement of temperature with resistive elements (RTDs). With 3-wire connections. All the RTDs must be isolated from ground.

The AI830/AI830A can be used with Pt100, Cu10, Ni100, Ni120 or resistive sensors. Linearization and conversion of the temperature to Centigrade or Fahrenheit is performed on the module. Every channel can be individually configured.

The MainsFreq parameter is used to set mains frequency filter cycle time. This will give a notch filter at the frequency specified (50 Hz or 60 Hz).

Four different types of MTUs can be used. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU enables three wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

Shielded field cables are required for process connections.



**Technical Data***Table 20. AI830/AI830A RTD Input Module Specifications at 25°C*

Feature	AI830/AI830A RTD Input Module
Number of channels	8
Type of input	3-wire RTD: Pt100, Cu10, Ni100, Ni120 and resistive potentiometer
Measurement range	See <a href="#">Table 21</a>
Maximum field cable resistance	55 $\Omega$ for AI830 up to PR:F 500 $\Omega$ for AI830A and AI830 from PR:G
Error dependent of the field cable resistance $R_{err}$ =Error in ohm $R$ =Wire resistance $\Delta R$ =Difference in % between resistance in field cables, see <a href="#">Figure 34</a> .	$R_{err} = R \times (0.005 + \Delta R/100)$ $T_{err}^{\circ C} = R_{err} / (R_0 \times TCR)$ $T_{err}^{\circ F} = T_{err}^{\circ C} \times 1.8$
CMRR, 50 Hz, 60 Hz	>120 dB <sup>(1)</sup>
NMRR, 50 Hz, 60 Hz	>60 dB
Error (IEC 51-1) <sup>(2)(3)</sup>	See <a href="#">Table 21</a>
Resolution	See <a href="#">Table 21</a>
Temperature drift	See <a href="#">Table 21</a>
Update cycle time	150 ms + n x 95 ms <sup>(4)</sup>
Current consumption 24 V (Modulebus)	50 mA
Current consumption 5 V (Modulebus)	70 mA
Power dissipation	1.6 W
Supervision	Open-circuit, short-circuit <sup>(5)</sup> , reference channel, internal power supply

Table 20. AI830/AI830A RTD Input Module Specifications at 25°C (Continued)

Feature	AI830/AI830A RTD Input Module
Isolation	Groupwise isolated from ground
Mounting termination units	TU810, TU812, TU814 or TU830
MTU keying code	AF
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

- (1) At 10 Ω load, e.g. Cu 10. CMMR is >80 dB at <400 Ω load and >110 dB at 100 Ω.
- (2) Without error dependent of the field cable resistance
- (3) Activated and not correctly connected channels can have negative influence on the accuracy of other channels.
- (4) n=Number of active channels
- (5) For Cu10, not short circuit.

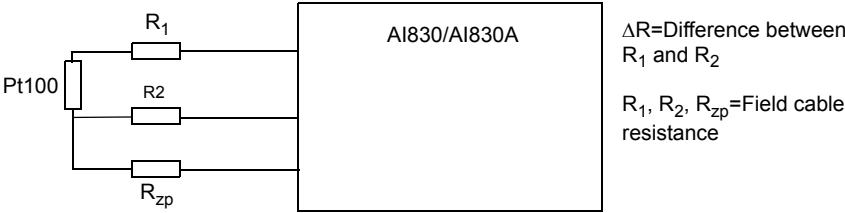


Figure 34. Error dependency of the field cable resistance

Table 21. AI830/AI830A Signal Range

Temperature Range	Sensor Type	Max Error		Resolution		MaxTemp Drift
		50 Hz	60 Hz	50 Hz	60 Hz	
-80...80°C	Pt100 <sup>(1)</sup>	0.10°C	0.11°C	0.025°C	0.030°C	0.0017°C/°C
-112...176°F	Pt100 <sup>(1)</sup>	0.18°F	0.20°F	0.046°F	0.055°F	0.003°F/°F
-200...250°C	Pt100 <sup>(1)</sup>	0.15°C	0.16°C	0.026°C	0.031°C	0.0028°C/°C
-328...482°F	Pt100 <sup>(1)</sup>	0.27°F	0.29°F	0.046°F	0.055°F	0.0050°F/°F
-200...850°C	Pt100 <sup>(1)</sup>	0.31°C	0.34°C	0.056°C	0.067°C	0.007°C/°C
-328...1562°F	Pt100 <sup>(1)</sup>	0.57°F	0.61°F	0.10°F	0.12°F	0.013°F/°F
-60...180°C	Ni100 <sup>(2)</sup>	0.10°C	0.12°C	0.031°C	0.037°C	0.0021°C/°C
-76...356°F	Ni100 <sup>(2)</sup>	0.19°F	0.21°F	0.056°F	0.067°F	0.0038°F/°F
-80...260°C	Ni120 <sup>(3)</sup>	0.27°C	0.29°C	0.022°C	0.026°C	0.0029°C/°C
-112...500°F	Ni120 <sup>(3)</sup>	0.49°F	0.51°F	0.039°F	0.046°F	0.0053°F/°F
-100...260°C	Cu10 <sup>(4)</sup>	1.0°C	1.2°C	0.26°C	0.31°C	0.024°C/°C
-148...500°F	Cu10 <sup>(4)</sup>	1.8°F	2.2°F	0.46°F	0.56°F	0.0043°F/°F
0...400 Ω	Resistor	0.083 Ω	0.091 Ω	0.020 Ω	0.024 Ω	0.0020 Ω/°C
-200...880°C <sup>(5)</sup>	Pt100	0.29°C	0.32°C	0.056°C	0.067°C	0.007°C/°C
-328...1616°F <sup>(5)</sup>	Pt100	0.53°F	0.58°F	0.10°F	0.12°F	0.013°F/°F
-200...880°C <sup>(6)</sup>	Pt100	0.30°C	0.32°C	0.055°C	0.066°C	0.007°C/°C
-328...1616°F <sup>(6)</sup>	Pt100	0.53°F	0.58°F	0.10°F	0.12°F	0.012°F/°F
-80...80°C <sup>(7)</sup>	Pt100	0.10°C	0.11°C	0.025°C	0.030°C	0.0017°C/°C
-112...176°F <sup>(7)</sup>	Pt100	0.18°F	0.19°F	0.046°F	0.055°F	0.003°F/°F
-200...250°C <sup>(7)</sup>	Pt100	0.14°C	0.15°C	0.025°C	0.031°C	0.0027°C/°C
-328...428°F <sup>(7)</sup>	Pt100	0.25°F	0.28°F	0.046°F	0.055°F	0.005°F/°F



Table 21. AI830/AI830A Signal Range (Continued)

Temperature Range	Sensor Type	Max Error		Resolution		MaxTemp Drift
		50 Hz	60 Hz	50 Hz	60 Hz	
-200...850°C <sup>(7)</sup>	Pt100	0.30°C	0.33°C	0.056°C	0.067°C	0.007°C/°C
-328...1562°F <sup>(7)</sup>	Pt100	0.54°F	0.59°F	0.10°F	0.12°F	0.013°F/°F
-200...649°C <sup>(8)</sup>	Pt100	0.25°C	0.27°C	0.053°C	0.064°C	0.0052°C/°C
-328...1200°F <sup>(8)</sup>	Pt100	0.45°F	0.49°F	0.096°F	0.12°F	0.0094°F/°F

(1) According to IEC 751, IPTS-68, TCR = 0.00385

(2) According to DIN 43760, TCR = 0.00617

(3) According to MIL-T-24388C, TCR = 0.00672

$R_0 = 120\ \Omega$  (MINCO)

(4) According to TCR = 0.00427,  $R_{25} = 10\ \Omega$  (MINCO)

(5) According to US Industrial Std, TCR = 0.00391. Only supported by AI830A.

(6) According to US Lab Std IPTS-68, TRC = 0.00392. Only supported by AI830A.

(7) According to IEC 751, ITS-90 (JIS C 1604-1997), TRC = 0.00385. Only supported by AI830A.

(8) According to JIS C 1604:1981. Only supported by AI830A.

Block Diagram AI830/AI830A

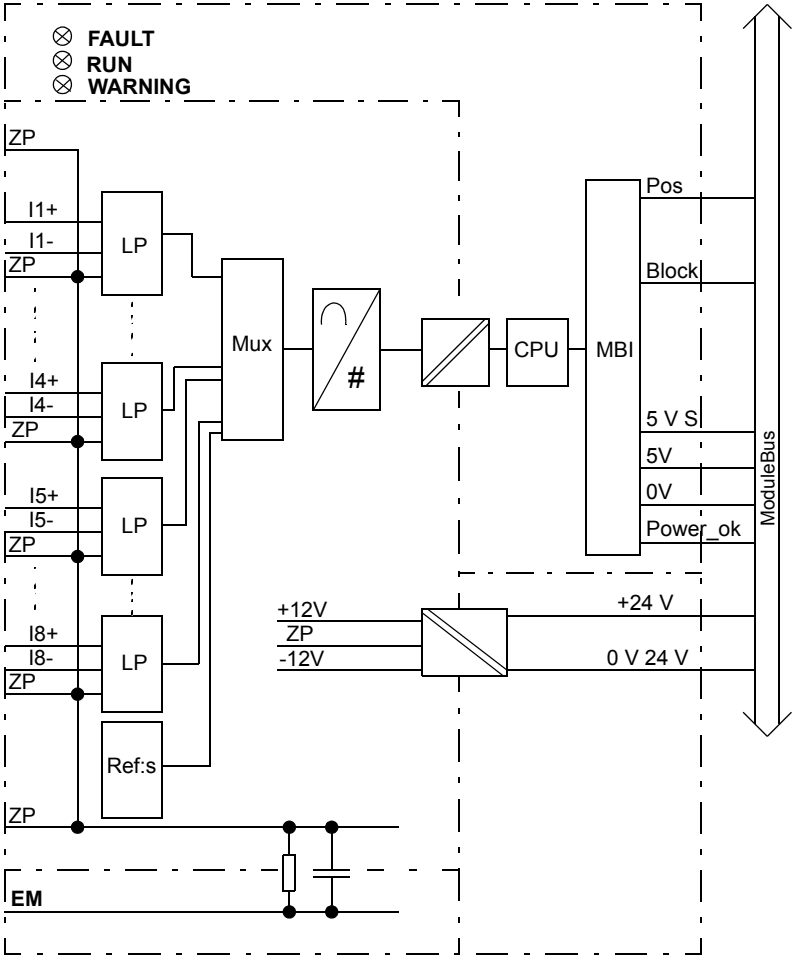


Figure 35. AI830/AI830A Block Diagram

**Process Connections***Table 22. AI830/AI830A Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector <sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>
-	L1+ (2)	1, 14	L1+ (2)
-	L1-	2, 15	L1- (2)
-	-	-	B1, B2
Ch1, + Input	C1	3	C1
Ch1, - Input	B1	16	C2
Ch1, Return (ZP)	A1	-	A1, A2
-	-	-	B3, B4
Ch 2, + Input	C2	4	C3
Ch 2, - Input	B2	17	C4
Ch 2, Return (ZP)	A2	-	A3, A4
-	-	-	B5, B6
Ch 3, + Input	C3	5	C5
Ch 3, - Input	B3	18	C6
Ch 3, Return (ZP)	A3	-	A5, A6
-	-	-	B7, B8
Ch 4, + Input	C4	6	C7
Ch 4, - Input	B4	19	C8
Ch 4, Return (ZP)	A4	-	A7, A8
-	-	-	B9, B10
Ch 5, + Input	C5	7	C9

Table 22. AI830/AI830A Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal
Ch 5, - Input	B5	20	C10
Ch 5, Return (ZP)	A5	-	A9, A10
-	-	-	B11, B12
Ch 6, + Input	C6	8	C11
Ch 6, - Input	B6	21	C12
Ch 6, Return (ZP)	A6	-	A11, A12
-	-	-	B13, B14
Ch 7, + Input	C7	9	C13
Ch 7, - Input	B7	22	C14
Ch 7, Return (ZP)	A7	-	A13, A14
-	-	-	B15, B16
Ch 8, + Input	C8	10	C15
Ch 8, - Input	B8	23	C16
Ch 8, Return (ZP)	A8	-	A15, A16
-	L2+ (2)	11, 24	L2+ (2)
-	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 36 shows the process connections for the RTD Input Module AI830/AI830A when installed on a TU830 Extended MTU.

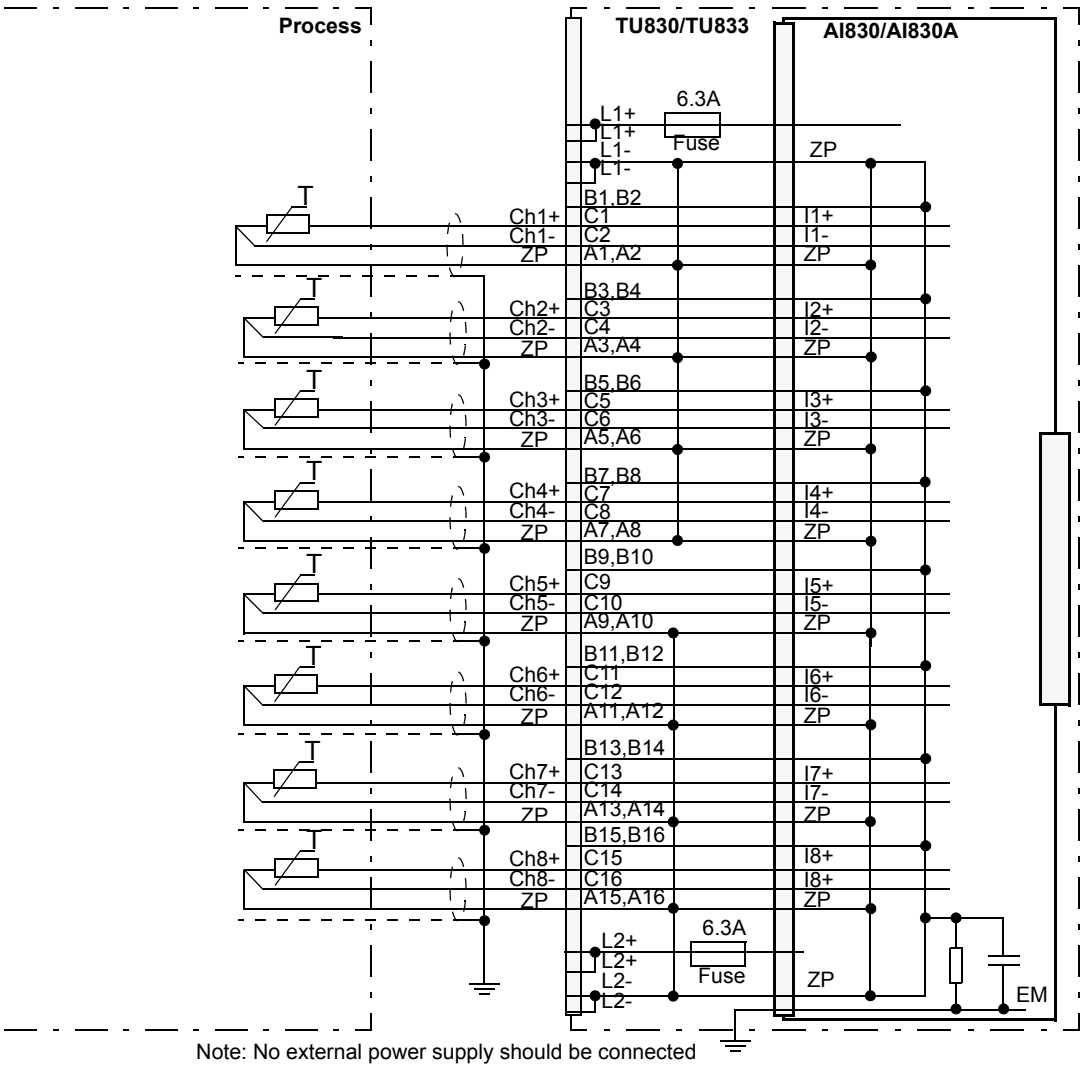
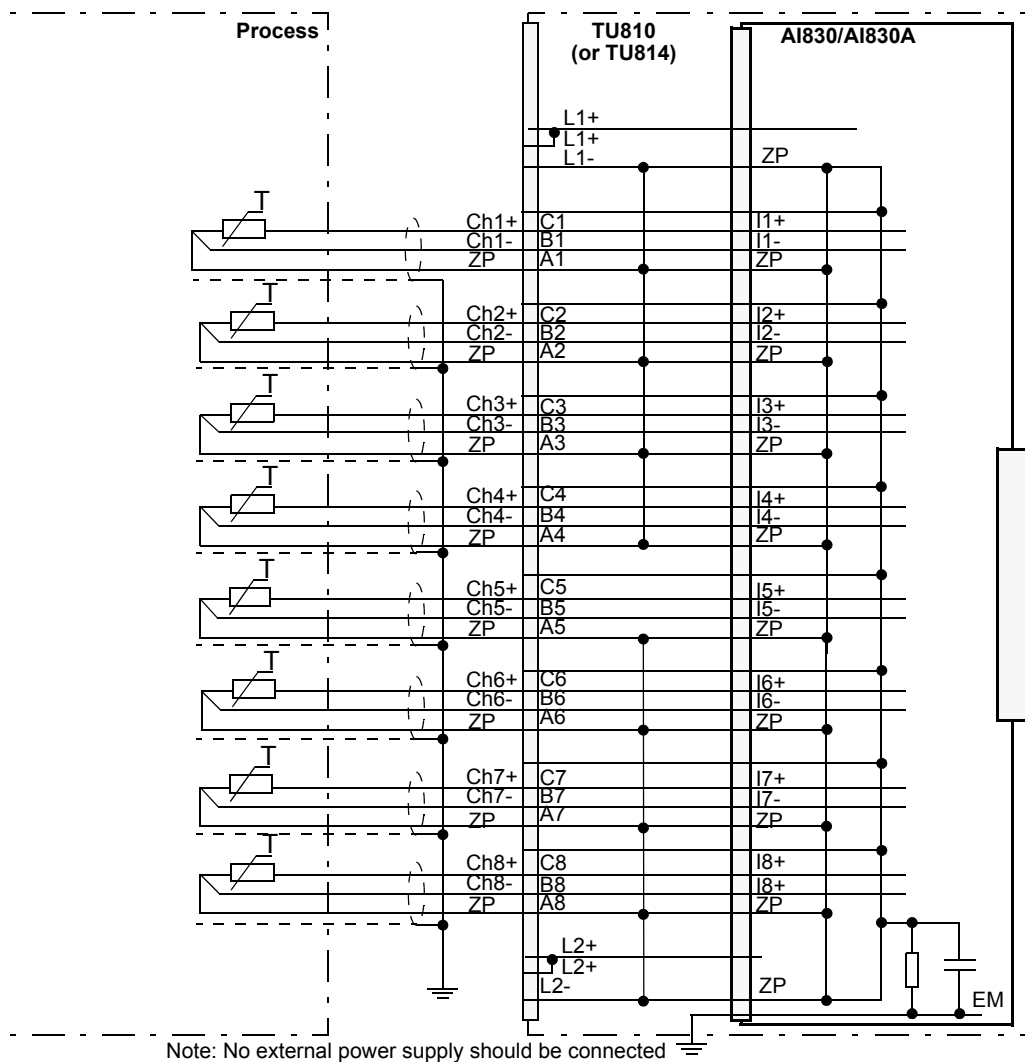


Figure 36. AI830/AI830A with TU830 Extended MTU Process Connections

Figure 37 shows the process connections for the AI830/AI830A when installed on a TU810 or TU814 Compact MTU.



*Figure 37. AI830/AI830A with TU810 or TU814 Compact MTU Process Connections*

Figure 38 shows the connections for the AI830/AI830A when installed on a TU812.

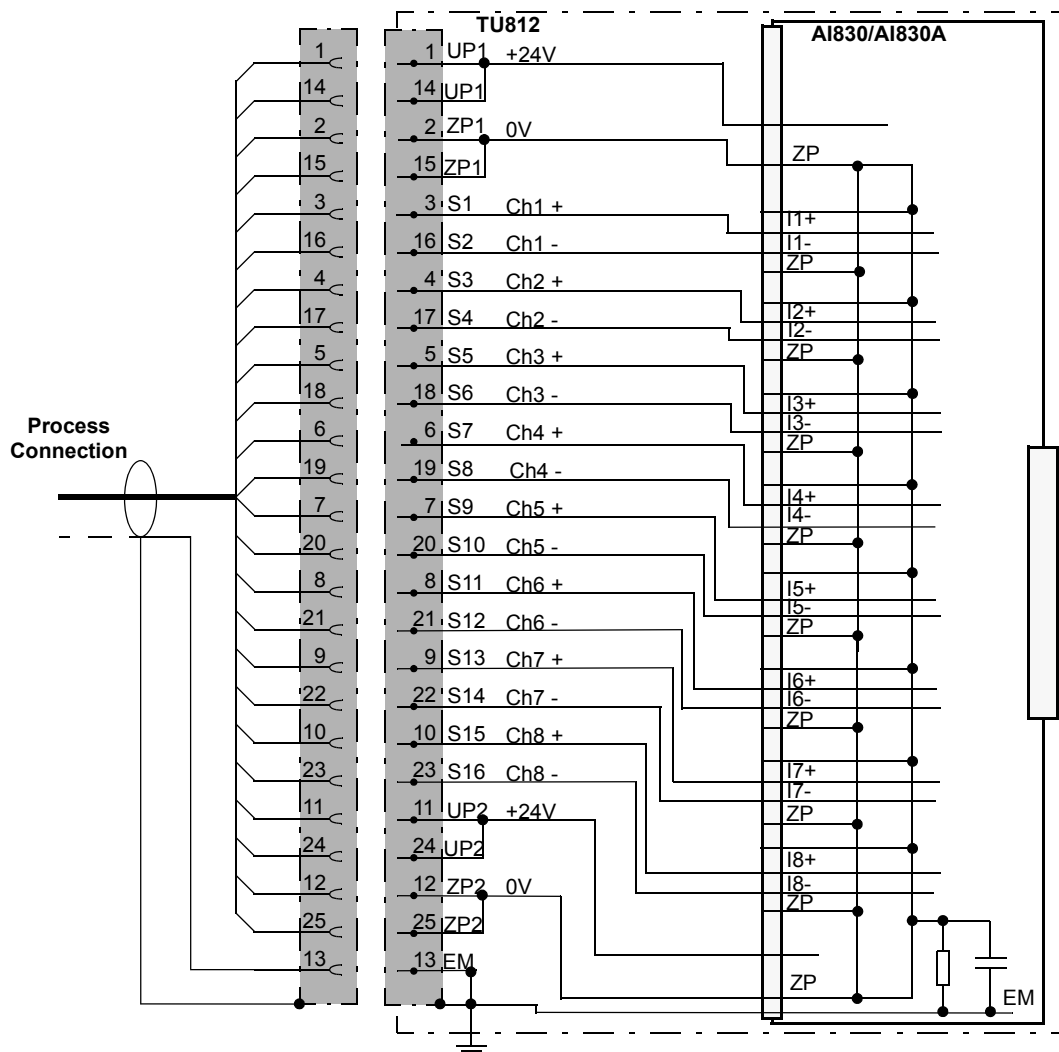


Figure 38. AI830/AI830A with TU812 Compact MTU Process Connections

## AI835/AI835A Thermocouple/mV Input Module

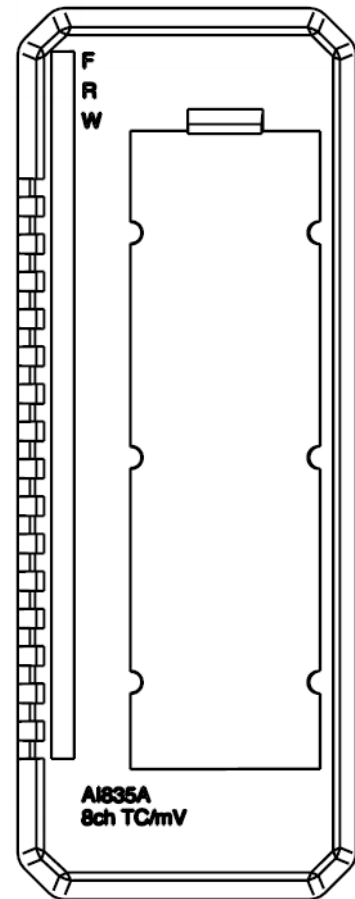
### Features

- 8 differential input channels for thermocouple/mV.
- Channel 8 can be designated as the CJ-channel (4-wire Pt100 RTD).
- Variety of thermocouples with the following characteristics: B, C, E, J, K, N, R, S and T for AI835A also D, L and U.
- 15 Bit resolution (A/D).
- Inputs are monitored for wire-break open-circuit.

### Description

The AI835/AI835A Thermocouple/mV Input Module is part of the S800 I/O. It provides 8 differential input channels for Thermocouple/mV measurements. Measurement ranges configurable per channel are: -30 mV to +75 mV linear, or TC Types B, C, E, J, K, N, R, S and T, for AI835A also D, L and U.

One of the channels (Channel 8) may be configured for “Cold Junction” (ambient) temperature measurements, thus serving as CJ-channel for Ch. 1...7. The junction temperature may be measured locally on the MTUs screw terminals, or on a connection unit distant from the device. Alternatively, a fix junction temperature for the module may be set by the user (as parameter) or for AI835A also from the application. Channel 8 may be used in the same manner as Ch. 1...7 when no CJ-temperature measurement is needed.





Each input-channel can measure a mV type of signal source (Thermocouple or linear), and may be grounded or ungrounded.

Full self-calibration is obtained by means of 0V, 50 mV and 100 ohm references, which are regularly updated.

Six different types of MTUs can be used. The TU830 (or TU833) Extended MTU or the TU810 (or TU814) Compact MTU enables three wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. TU818 Compact MTU provides connection to 2-wire transmitters without external marshaling.

Shielded field cables are required for process connections.

### Technical Data

*Table 23. AI835/AI835A Thermocouple/mV Input Module Specifications at 25°C*

Feature	AI835/AI835A Thermocouple/mV Input Module
Number of channels	8 (Differential)
Type of input	-30 mV to 75 mV linear, or TC types B, C, E, J, K, N, R, S and T. AI835A also D, L and U.
Measurement range	See <a href="#">Table 24</a>
Input impedance	> 1 MΩ
CJ-temperature measurement reference	4-wire connected IEC-751/Pt100 RTD, TY820 can be used
Maximum field cable length	600 meters (656 yd.)
CMV between channels, max.	12 V d.c.
CMRR, 50 Hz, 60 Hz	120 dB
NMRR, 50 Hz, 60 Hz	>60 dB <sup>(1)</sup>
Resolution (A/D)	15 bits

Table 23. AI835/AI835A Thermocouple/mV Input Module Specifications at 25°C  
(Continued)

Feature	AI835/AI835A Thermocouple/mV Input Module
Error	0.1%
Temperature drift	Typ. 5 ppm/°C Max. 7 ppm/°C (AI835A) Max. 30 ppm/°C (AI835)
Filter, analog (1st order Low-pass)	10 Hz
Filter (integration)	50 Hz or 60 Hz
Update cycle time, max.	280 ms + n x 80 ms at 50 Hz 250 ms + n x 70 ms at 60 Hz (n = active channels)
Supervision	Module: reference channels, power supply low Channel: open-circuit <sup>(2)</sup> CJ-channel(CH8): <-40°C (-40°F) and >100°C (212°F)
Current consumption 24 V (Modulebus)	50 mA
Current consumption 5 V (Modulebus)	75 mA
Power dissipation	1.6 W
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812, TU814, TU818, TU830 or TU833
MTU keying code	BA
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) >40 dB at 50 Hz and 60 Hz ±1%

(2) Cycle time for open circuit supervision = (Update cycle time) \* (number of active channels)

Table 24. AI835/AI835A Range/Linearization

Input Type	Temperature Range
TC type B <sup>(1)</sup>	44...1820°C, 111.2...3308°F
TC type C	0...2300°C, 32...4172°F
TC type D <sup>(2)</sup>	0...2300°C, 32...4172°F
TC type E <sup>(1)</sup>	-270...1000°C, -454...1832°F
TC type J <sup>(1)</sup>	-210...1200°C, -346...2192°F
TC type K <sup>(1)</sup>	-270...1372°C, -454...2501.6°F
TC type L <sup>(2)</sup>	-200...900 °C, -328...1652 °F
TC type N <sup>(1)</sup>	-270...1300°C, -454...2372°F
TC type R <sup>(1)</sup>	-50...1768°C, -58...3214.4°F
TC type S <sup>(1)</sup>	-50...1768°C, -58...3214.4°F
TC type T <sup>(1)</sup>	-270...400°C, -454...752°F
TC type U <sup>(2)</sup>	-200...600 °C, -328...1112 °F
Linear range	-30...75 mV
Pt100 RTD (for CJC) <sup>(3)</sup>	-40...100°C, -40...212°F

(1) Linearization per IEC 584-1 1995, and following ITS 90 requirements.

(2) Only for AI835A

(3) Sensor Type applies to Channel 8 only, for the measuring of the Cold Junction Compensation temperature.



From the 11 Sensor Types above, one choice is to be selected by the user **per channel**.

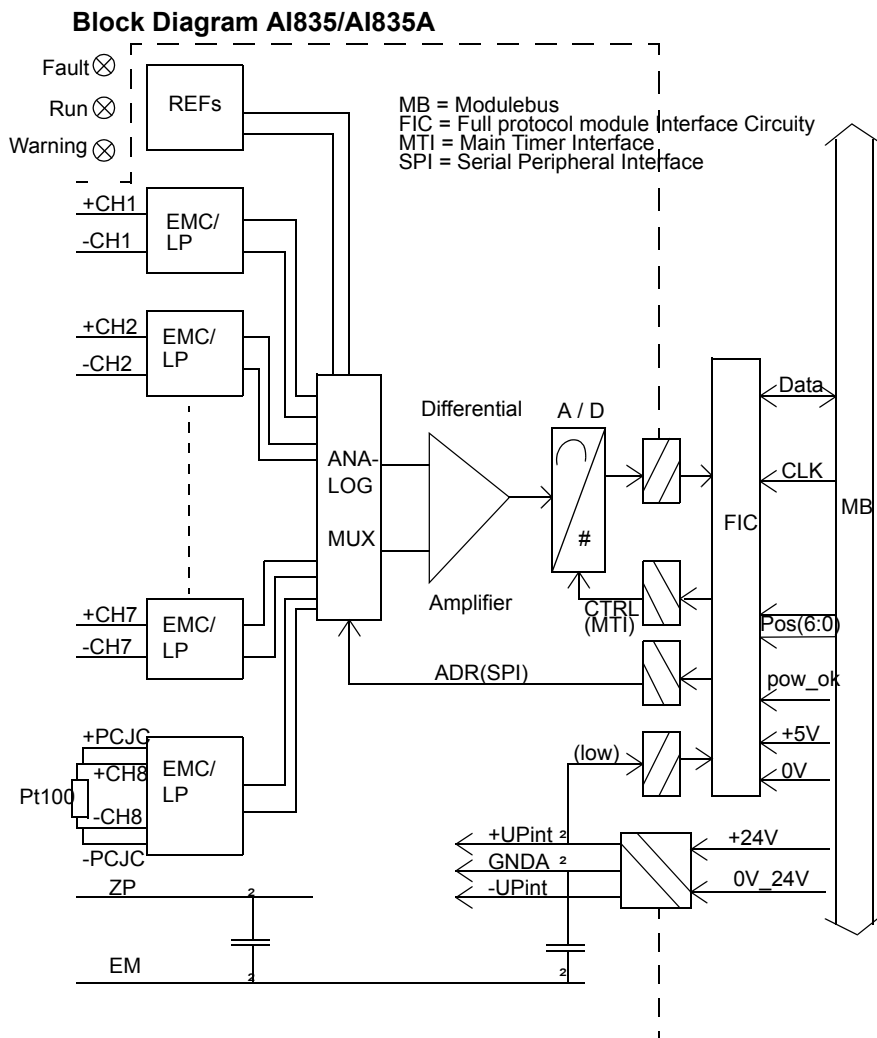


Figure 39. AI835/AI835A Block Diagram

**Process Connections***Table 25. AI835/AI835A Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector <sup>(1)</sup></b>	<b>TU818 Terminal</b>	<b>TU830/ TU833 Terminal</b>
Pt100, PCJC-	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
-	L1-	2, 15	L1- (2)	L1- (2)
-	-	-	-	B1, B2
Ch1, + Input	C1	3	D1	C1
Ch1, - Input	B1	16	B1	C2
Ch1, Return (ZP)	A1	-	-	A1, A2
-	-	-	-	B3, B4
Ch 2, + Input	C2	4	D2	C3
Ch 2, - Input	B2	17	B2	C4
Ch 2, Return (ZP)	A2	-	-	A3, A4
-	-	-	-	B5, B6
Ch 3, + Input	C3	5	D3	C5
Ch 3, - Input	B3	18	B3	C6
Ch 3, Return (ZP)	A3	-	-	A5, A6
-	-	-	-	B7, B8
Ch 4, + Input	C4	6	D4	C7
Ch 4, - Input	B4	19	B4	C8
Ch 4, Return (ZP)	A4	-	-	A7, A8
-	-	-	-	B9, B10
Ch 5, + Input	C5	7	D5	C9

Table 25. AI835/AI835A Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU818 Terminal	TU830/ TU833 Terminal
Ch 5, - Input	B5	20	B5	C10
Ch 5, Return (ZP)	A5	-	-	A9, A10
-	-	-	-	B11, B12
Ch 6, + Input	C6	8	D6	C11
Ch 6, - Input	B6	21	B6	C12
Ch 6, Return (ZP)	A6	-	-	A11, A12
-	-	-	-	B13, B14
Ch 7, + Input	C7	9	D7	C13
Ch 7, - Input	B7	22	B7	C14
Ch 7, Return (ZP)	A7	-	-	A13, A14
-	-	-	-	B15, B16
Ch 8, + Input	C8	10	D8	C15
Ch 8, - Input	B8	23	B8	C16
Ch 8, Return (ZP)	A8	-	-	A15, A16
Pt100, PCJC+	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
-	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 40 shows the process connections for the TC/mV Input Module AI835/AI835A when installed on a TU830/TU833 Extended MTU.

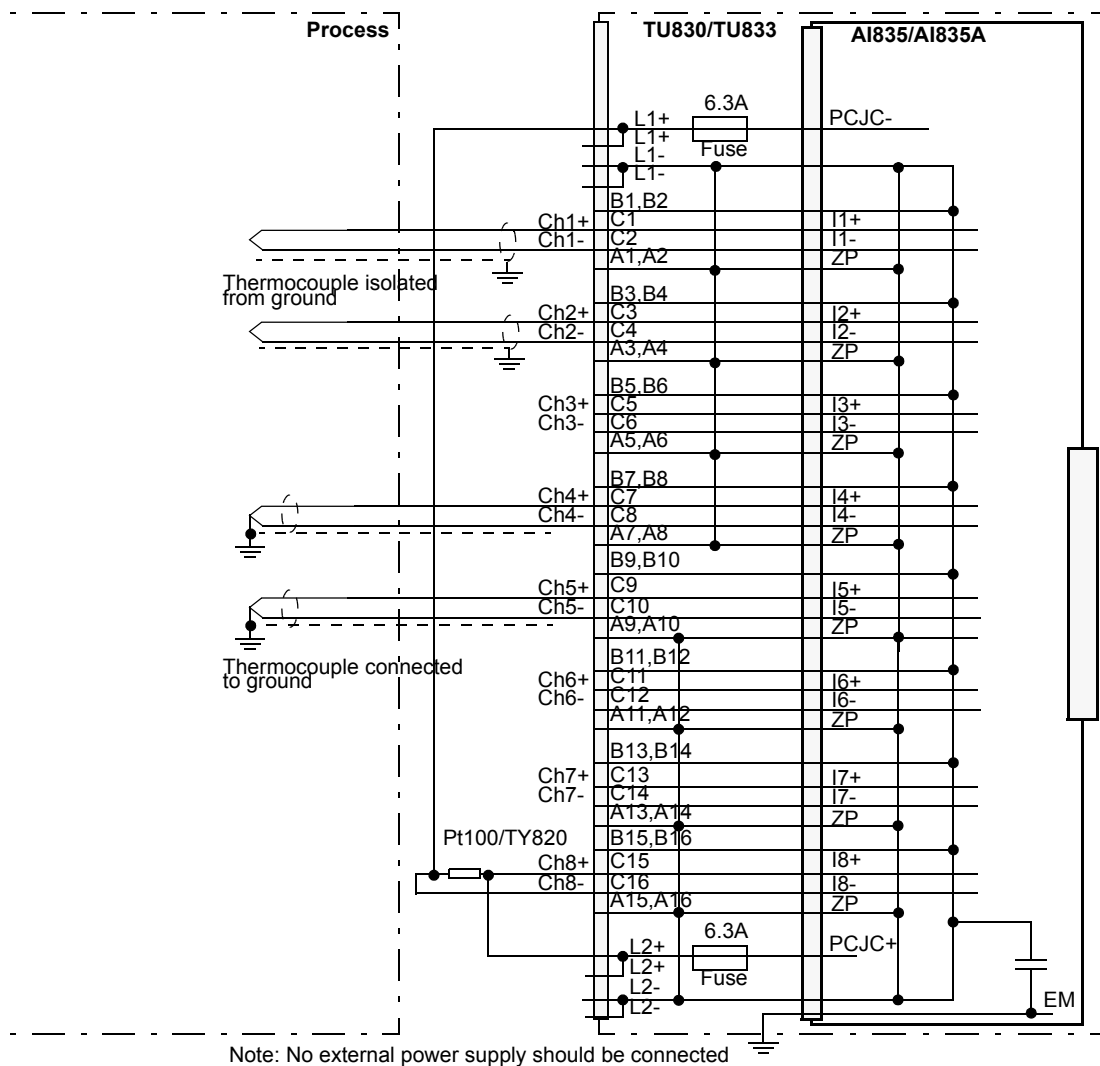


Figure 40. AI835/AI835A with TU830/TU833 Extended MTU Process Connections

Figure 41 shows the process connections for the AI835/AI835A when installed on a TU810 or TU814 Compact MTU.

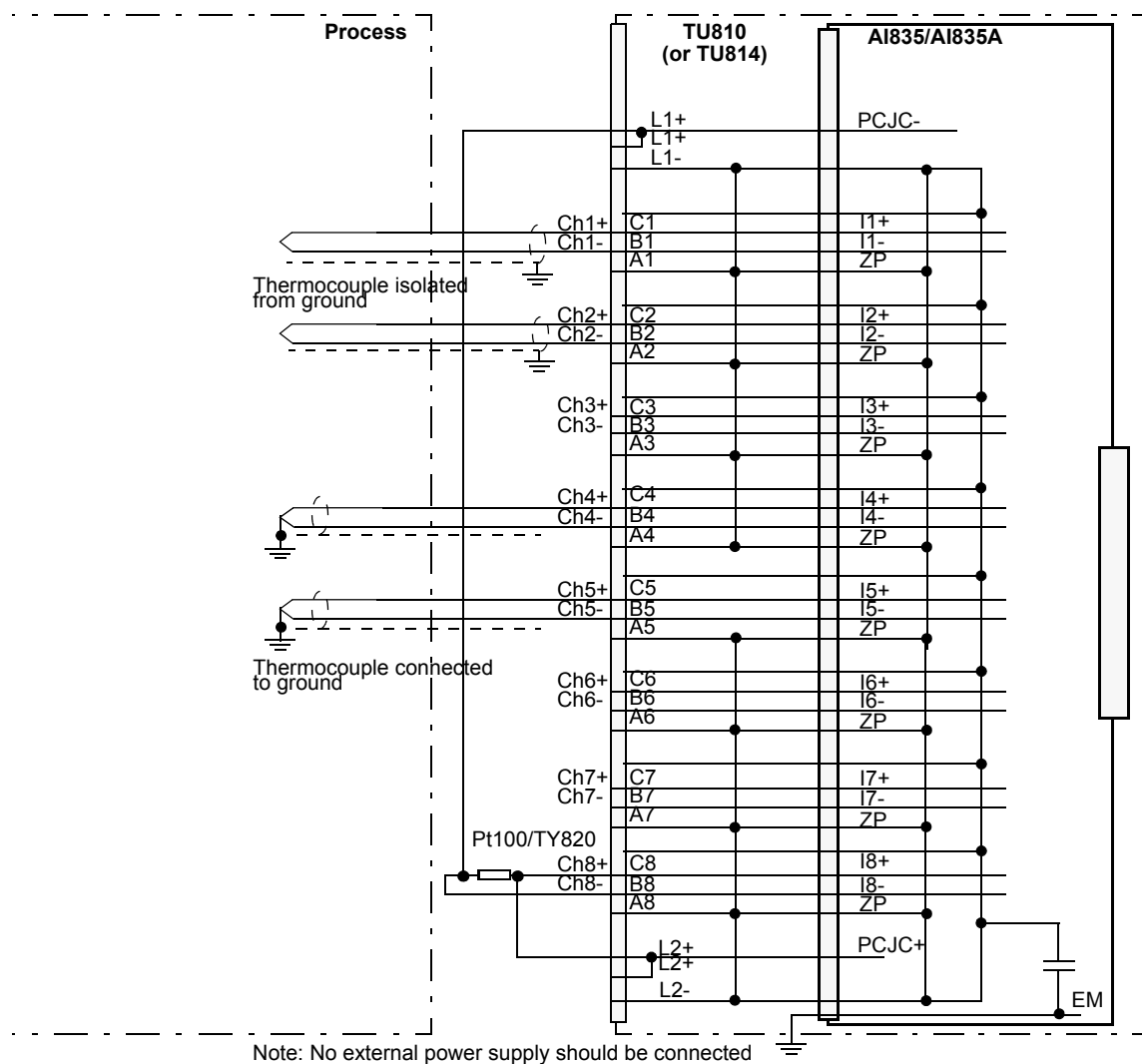


Figure 41. AI835/AI835A with TU810 or TU814 Compact MTU Process Connections



Figure 42 shows the AI835/AI835A connections through a remote junction box.

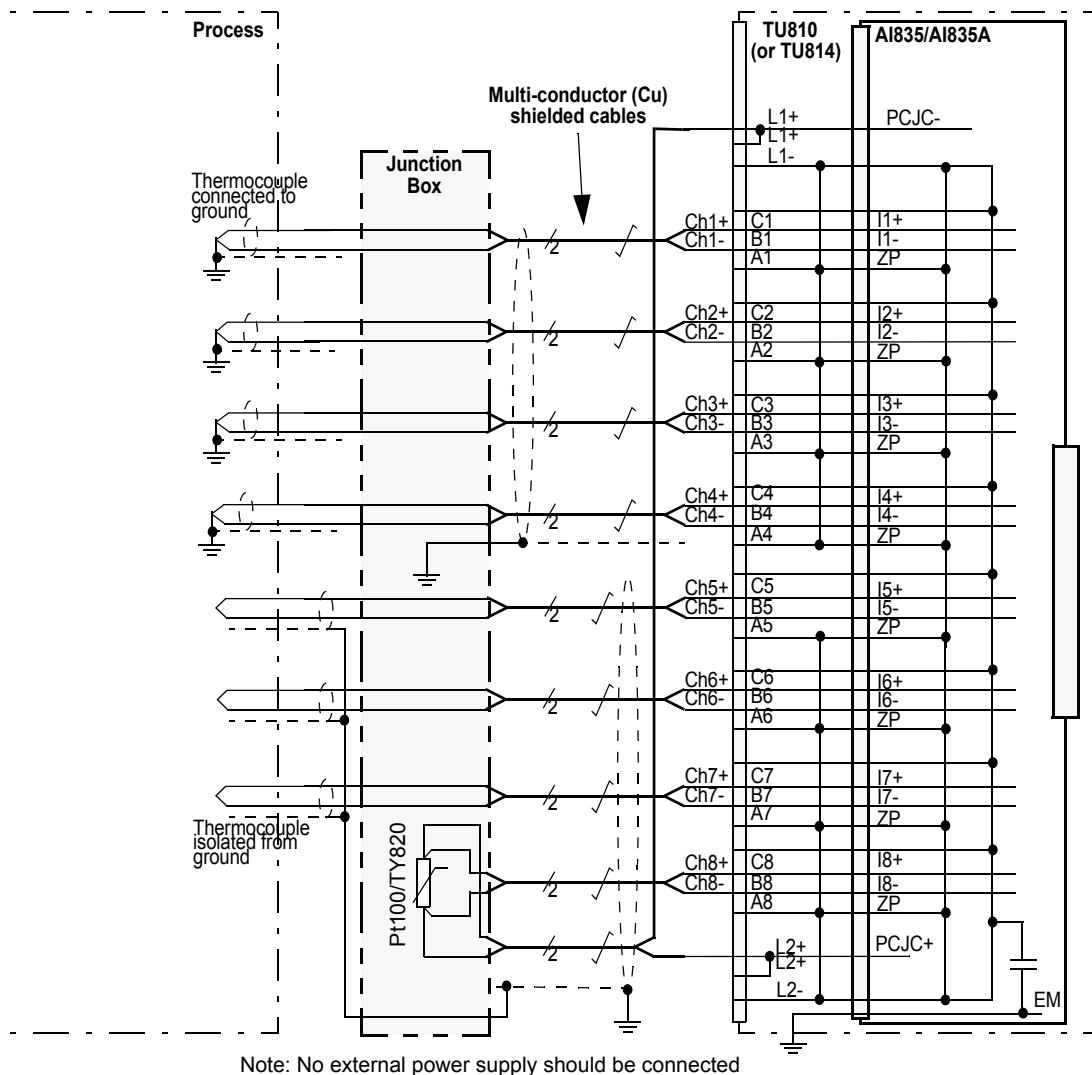


Figure 42. AI835/AI835A with TU810 or TU814 Compact MTU Process Connections to Remote Junction Box

Figure 43 shows the connections for the AI835/AI835A when installed on a TU812.

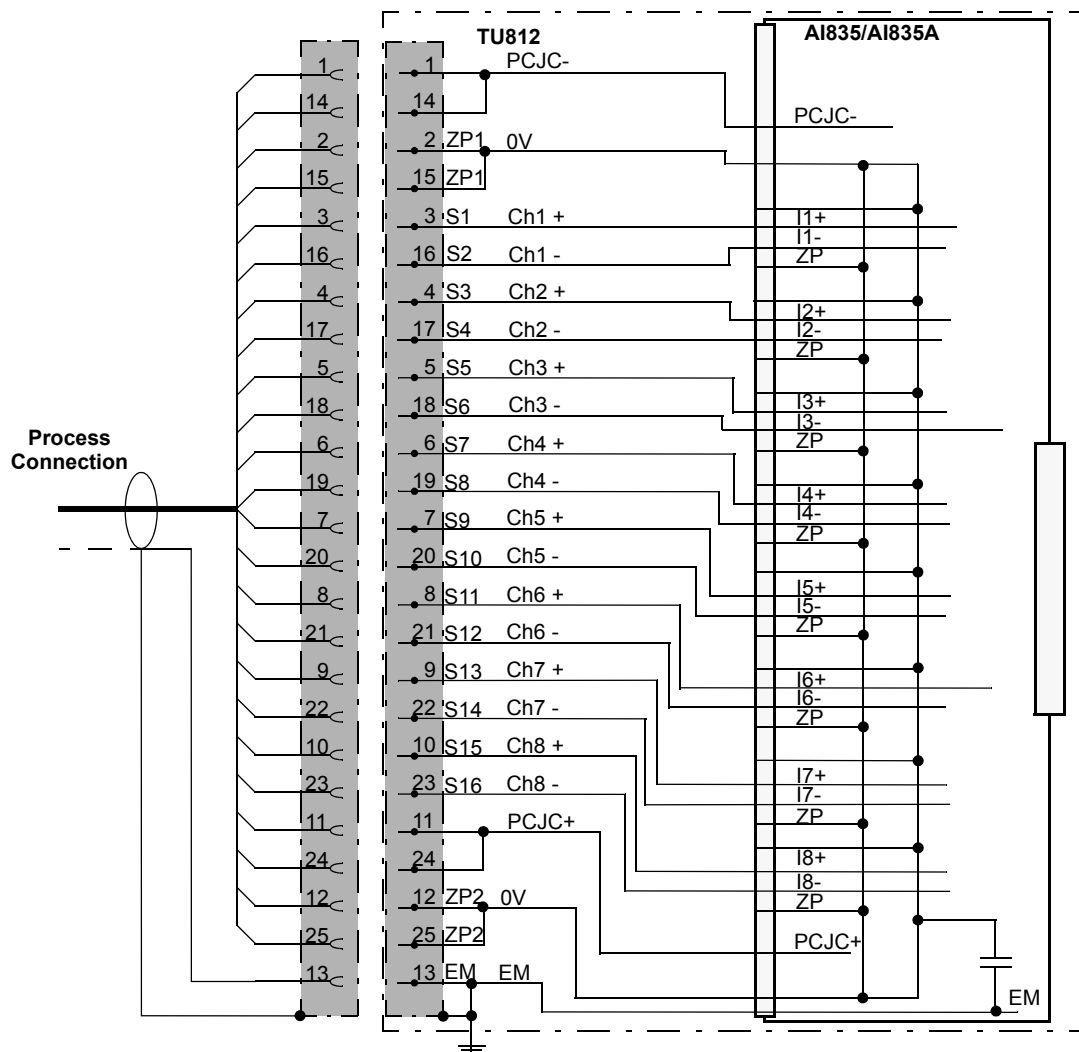


Figure 43. AI835/AI835A with TU812 Compact MTU Process Connections

Figure 44 shows the connections for the AI835A when installed on a TU818.

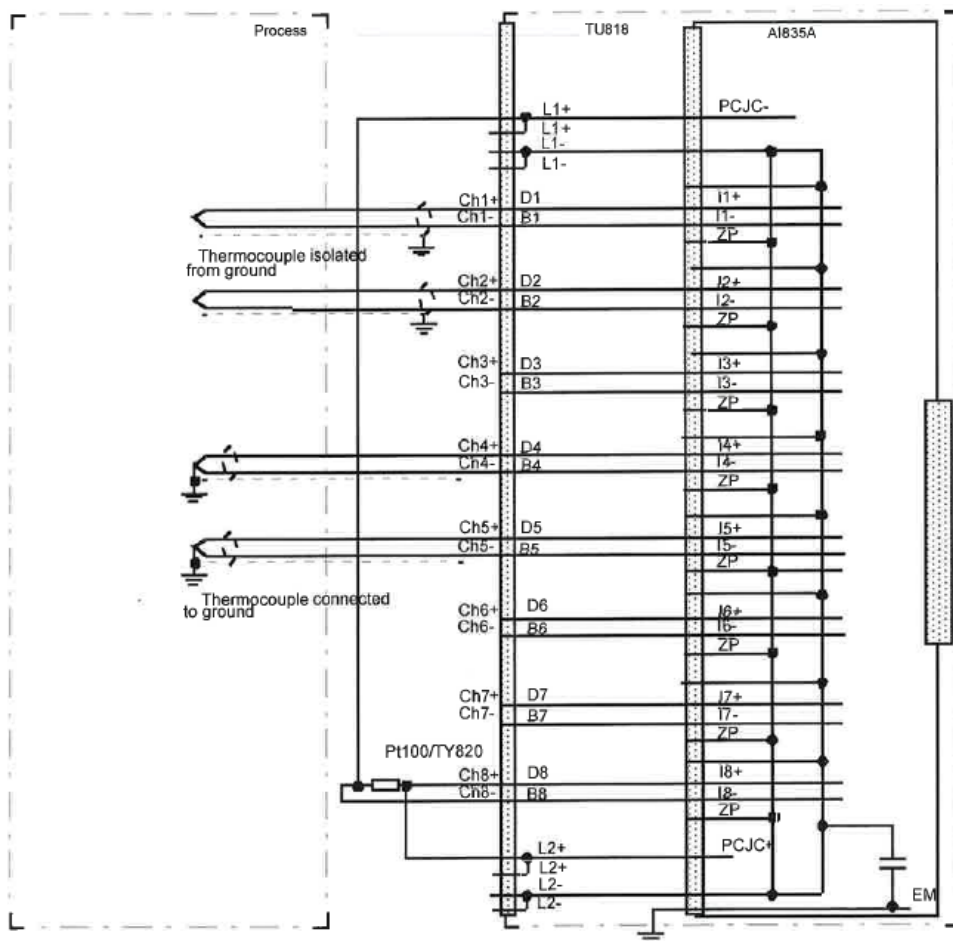


Figure 44. AI835A with TU818 Compact MTU Process Connections

## AI843 Thermocouple/mV Input Module

### Features

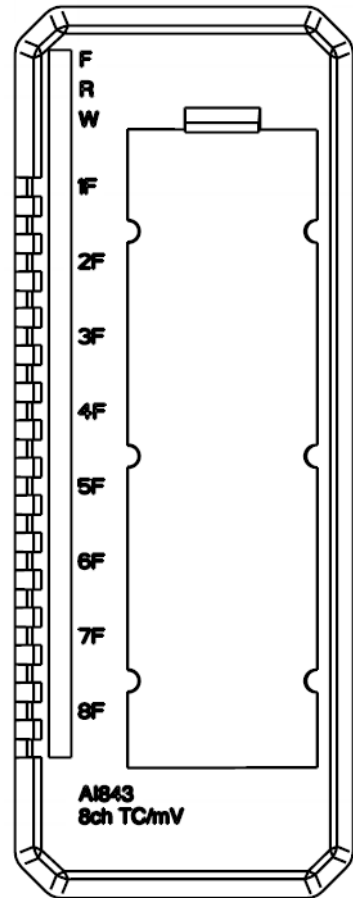
- 8 differential input channels for thermocouple/mV.
- Single or redundant operation.
- A separate channel is used as CJ-channel (4-wire Pt100 RTD).
- Variety of thermocouples with the following characteristics: B, C, E, J, K, L, N, R, S, T and U.
- 16 Bit resolution (A/D converter).
- Inputs are monitored for wire-break open-circuit.

### Description

The AI843 Thermocouple/mV Input Module is part of the S800 I/O. It provides 8 differential input channels for Thermocouple/mV measurements. Measurement ranges configurable per channel are:

-30 mV to +75 mV linear, or TC Types B, C, E, J, K, L, N, R, S, T and U.

A separate Pt100 channel is used for “Cold Junction” (ambient) temperature measurements, thus serving as CJ-channel for Ch. 1...8. See [Figure 46](#), [Figure 47](#) and [Figure 48](#) for connection of reference resistance and Pt100 sensor. The junction temperature may be measured locally on the MTUs screw terminals, or on a connection unit distant from the device. Alternatively, a fix junction temperature for the module may be set by the user (as parameter) or a junction temperature set by the application.



Each input-channel can measure a mV type of signal source (Thermocouple or linear), and may be grounded or ungrounded.

Full self-calibration is obtained by means of 0V and 30 mV references, which are regularly updated.

On each channel, there is a Fault (Red) LED that indicates channel error.

Three different types of MTUs can be used. In single applications, TU830 Extended MTU enables three wire connection to the devices without additional terminals.

In redundant applications, TU842 for horizontal mounting and TU843 for vertical mounting can be used.

Shielded field cables are required for process connections.

### Technical Data

Table 26. AI843 Thermocouple/mV Input Module Specifications at 25°C

Feature	AI843 Thermocouple/mV Input Module
Number of channels	8 (Differential)
Type of input	-30 mV to 75 mV linear, or TC types B, C, E, J, K, L, N, R, S, T and U
Measurement range	See <a href="#">Table 27</a>
Input impedance	> 1 MΩ
CJ-temperature measurement reference	4-wire connected IEC-751/Pt100 RTD, TY820 can be used
Maximum field cable length	600 meters (656 yd.) or max. 500 Ω
CMV between channels, max.	5 V d.c.
CMRR, 50 Hz, 60 Hz	100 dB
NMRR, 50 Hz, 60 Hz	>40 dB
Resolution (A/D converter)	16 bits

Table 26. AI843 Thermocouple/mV Input Module Specifications at 25°C  
(Continued)

Feature	AI843 Thermocouple/mV Input Module
Error	≤0.1%
Temperature drift	Typ. 10 ppm/°C Max. 25 ppm/°C
Filter, analog (1st order Low-pass)	1.1 kHz
Filter (integration)	50 Hz or 60 Hz
Update cycle time, max.	320 ms + n x 80 ms at 50 Hz 267 ms + n x 67 ms at 60 Hz (n = active channels)
Supervision	Module error if: reference channels outside limits, power supply low Channel error if: open-circuit, out of range <-40°C (-40°F) and >100°C (212°F) (only Cold Junction channel) Linear: none
Current consumption 24 V (Modulebus)	50 mA
Current consumption 5 V (Modulebus)	60 mA
Power dissipation	1.5 W
Isolation	Groupwise isolated from ground
Module termination units	TU818, TU830, TU842, TU843, and TU852
MTU keying code	B, A
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

Table 27. AI843 Range/Linearization

Input Type	Temperature Range
TC type B <sup>(1)</sup>	44...1820°C, 111.2...3308°F
TC type C	0...2300°C, 32...4172°F
TC type D	0...2300°C, 32...4172°F
TC type E <sup>(1)</sup>	-270...1000°C, -454...1832°F
TC type J <sup>(1)</sup>	-210...1200°C, -346...2192°F
TC type K <sup>(1)</sup>	-270...1372°C, -454...2501.6°F
TC type L	-200...900°C, -328...1652°F
TC type N <sup>(1)</sup>	-270...1300°C, -454...2372°F
TC type R <sup>(1)</sup>	-50...1768°C, -58...3214.4°F
TC type S <sup>(1)</sup>	-50...1768°C, -58...3214.4°F
TC type T <sup>(1)</sup>	-270...400°C, -454...752°F
TC type U	-200...600°C, -328...1112°F
Linear range	-30...75 mV
Pt100 RTD (for CJC) <sup>(2)</sup>	-40...100°C, -40...212°F

(1) Linearization per IEC 584-1 1995, and following ITS 90 requirements.

(2) Sensor Type applies to Cold Junction channel only, for the measuring of the Cold Junction Compensation temperature.



From the 11 Sensor Types above, one choice is to be selected by the user **per channel**.

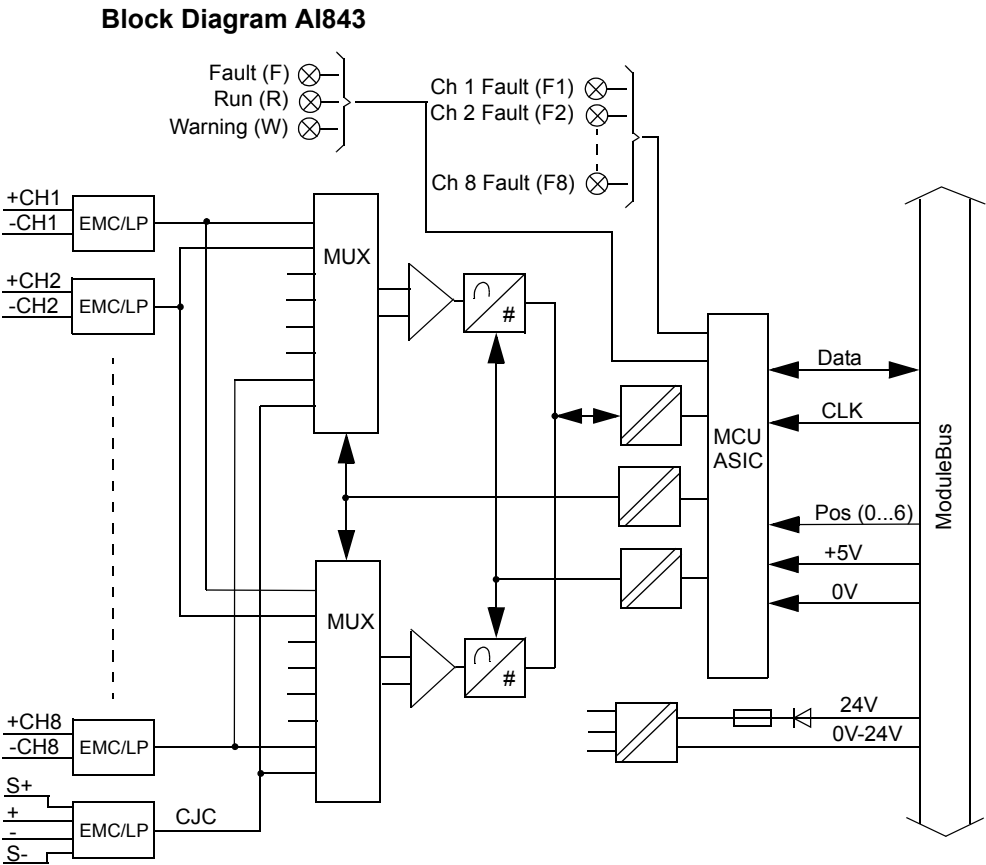


Figure 45. AI843 Block Diagram



**Process Connections***Table 28. AI843 Process Connections*

<b>Process Connection</b>	<b>TU818 Terminal</b>	<b>TU830, TU833, TU842, TU843 Terminal</b>	<b>TU852 Terminal</b>
PCJC+	C1	B1	3 (X1b)
Ch1, + Input	D1	C1	3 (X1a)
Ch1, - Input	B1	C2	16 (X1a)
Ch1, Return (ZP)	L1-	A1, A2	2, 15 (X1a and X1b)
ICJC+	A1	B2	16 (X1b)
ICJC-	C2	B3	4 (X1b)
Pref	A2	B4	17 (X1b)
Ch 2, + Input	D2	C3	4 (X1a)
Ch 2, - Input	B2	C4	17 (X1a)
Ch 2, Return (ZP)	L1-	A3, A4	2, 15 (X1a and X1b)
PCJC-	C3	B5	5 (X1b)
Ch 3, + Input	D3	C5	5 (X1a)
Ch 3, - Input	B3	C6	18 (X1a)
Ch 3, Return (ZP)	L1-	A5, A6	2, 15 (X1a and X1b)
Ch 4, + Input	D4	C7	6 (X1a)
Ch 4, - Input	B4	C8	19 (X1a)
Ch 4, Return (ZP)	L1-	A7, A8	2, 15 (X1a and X1b)
Ch 5, + Input	D5	C9	7 (X1a)
Ch 5, - Input	B5	C10	20 (X1a)
Ch 5, Return (ZP)	L2-	A9, A10	12, 25 (X1a and X1b)

Table 28. AI843 Process Connections (Continued)

Process Connection	TU818 Terminal	TU830, TU833, TU842, TU843 Terminal	TU852 Terminal
PCJC+	A6	B12	21 (X1b)
Ch 6, + Input	D6	C11	8 (X1a)
Ch 6, - Input	B6	C12	21 (X1a)
Ch 6, Return (ZP)	L2-	A11, A12	12, 25 (X1a and X1b)
ICJC+	C7	B13	9 (X1b)
ICJC-	A7	B14	22 (X1b)
Ch 7, + Input	D7	C13	9 (X1a)
Ch 7, - Input	B7	C14	22 (X1a)
Ch 7, Return (ZP)	L2-	A13, A14	12, 25 (X1a and X1b)
Pref	C8	B15	10 (X1b)
PCJC-	A8	B16	23 (X1b)
Ch 8, + Input	D8	C15	10 (X1a)
Ch 8, - Input	B8	C16	23 (X1a)
Ch 8, Return (ZP)	L2-	A15, A16	12, 25 (X1a and X1b)

Figure 46 shows the process connections for the TC/mV Input Module AI843 when installed on a TU830 Extended MTU.

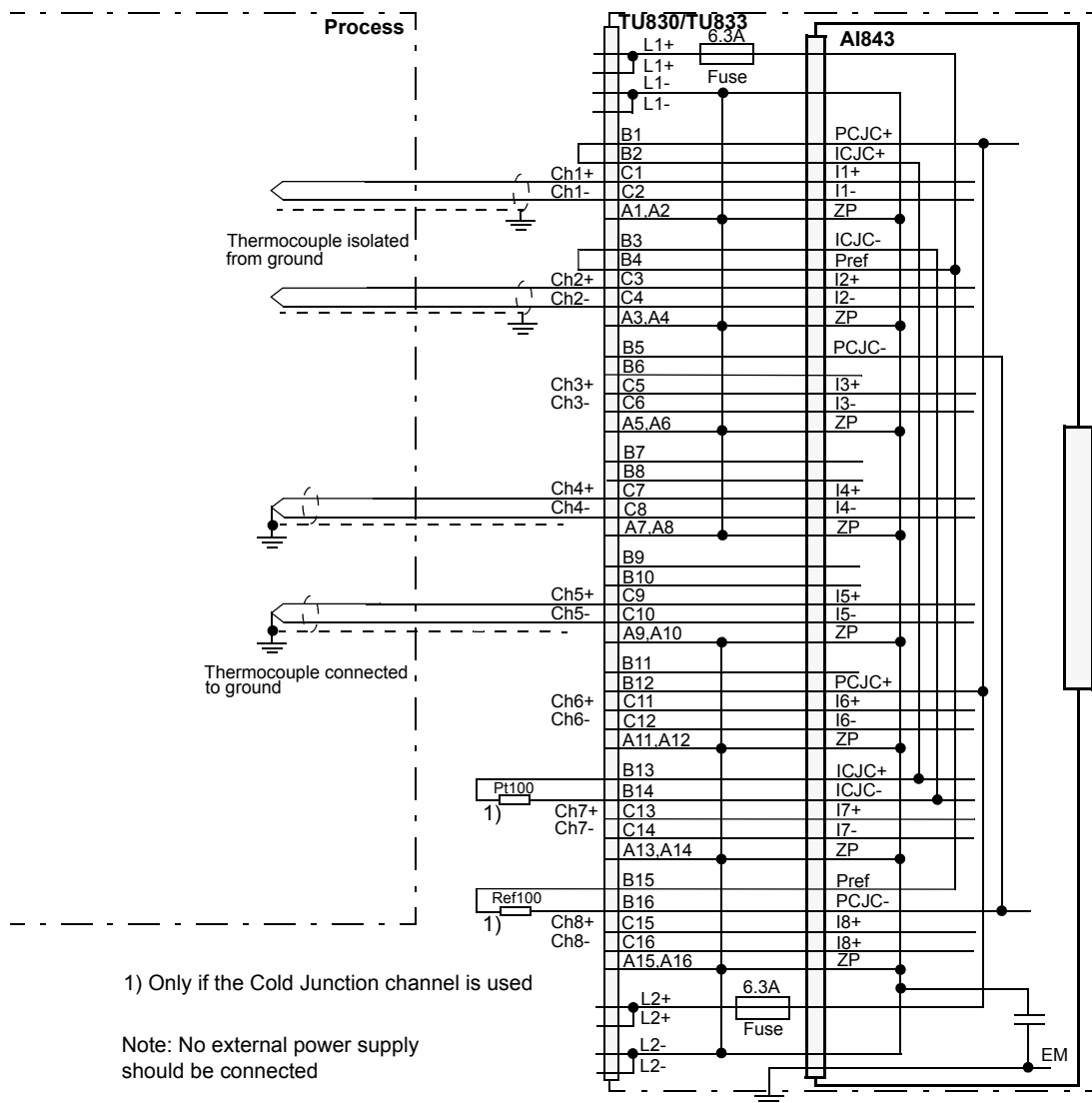


Figure 46. AI843 with TU830 Extended MTU Process Connections

Figure 47 shows the process connections for the TC/mV Input Module AI843 when installed on a TU830 Extended MTU.

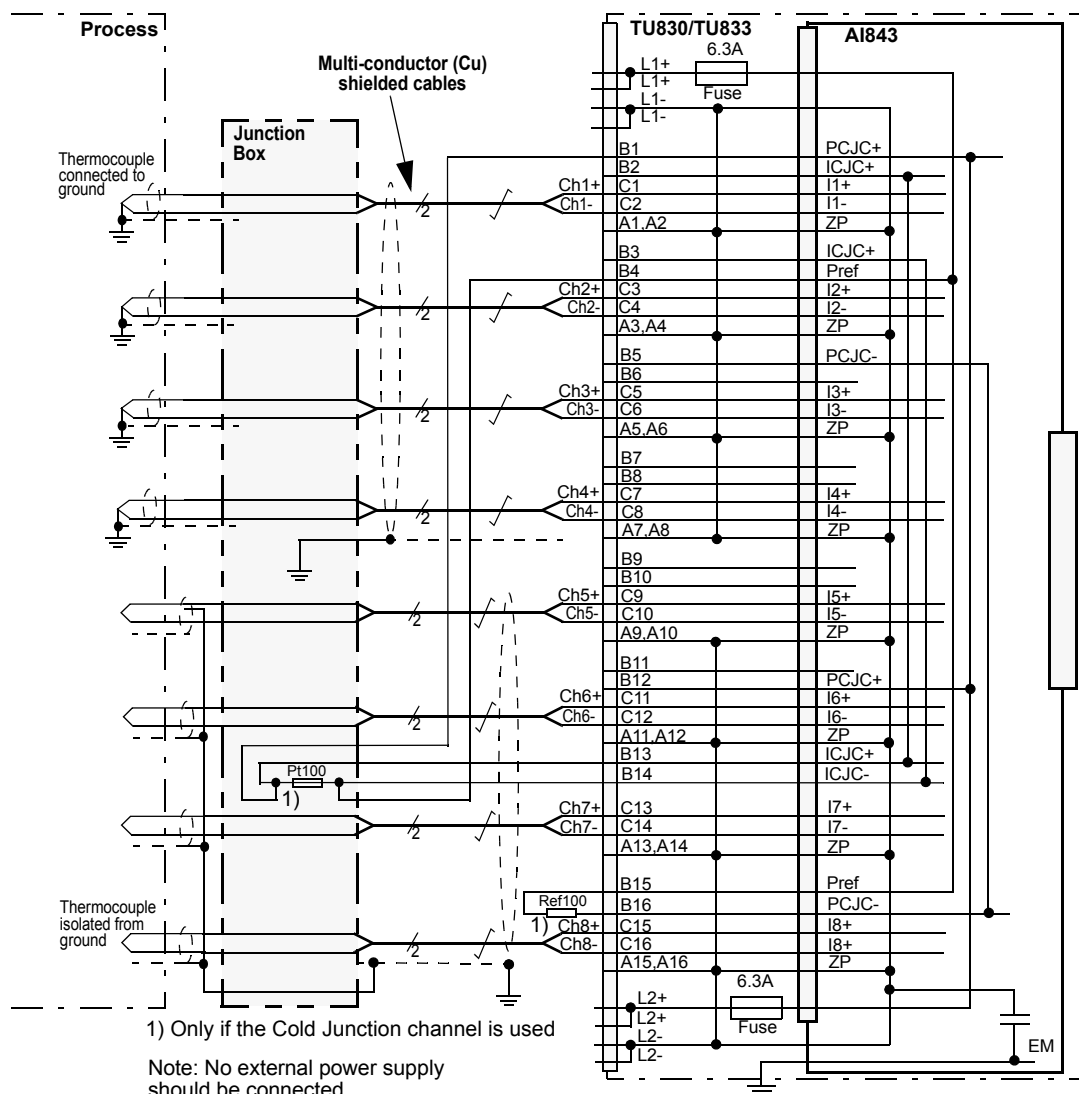


Figure 47. AI843 with TU830 Extended MTU Process Connections to Remote Junction Box

Figure 48 shows the process connections for the Thermocouple/mV Input Module AI843 when installed on a TU842 or TU843 Redundant MTU.

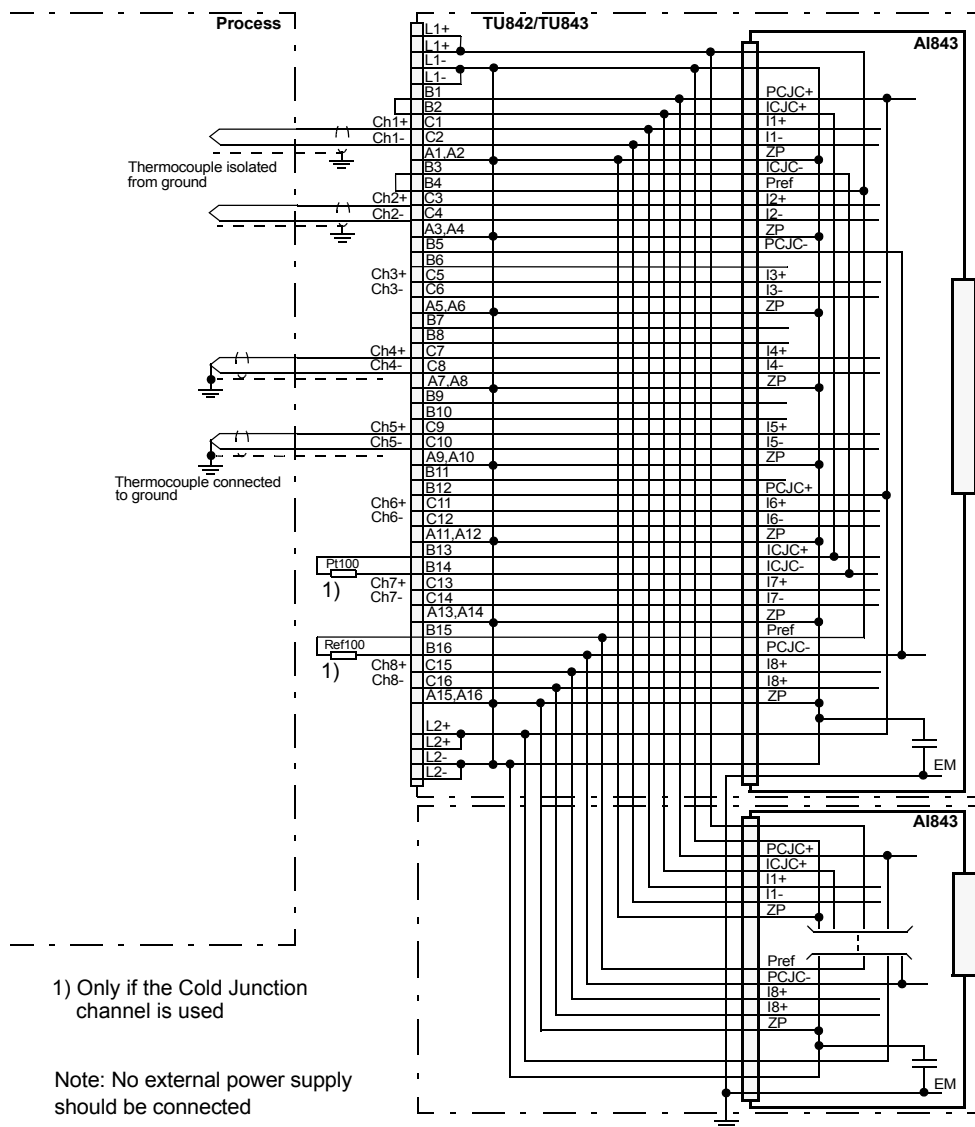


Figure 48. AI843 with TU842 or TU843 Extended MTU Process Connections

Figure 49 shows the process connections for the Thermocouple/mV Input Module AI843 when installed on a TU818 Compact MTU.

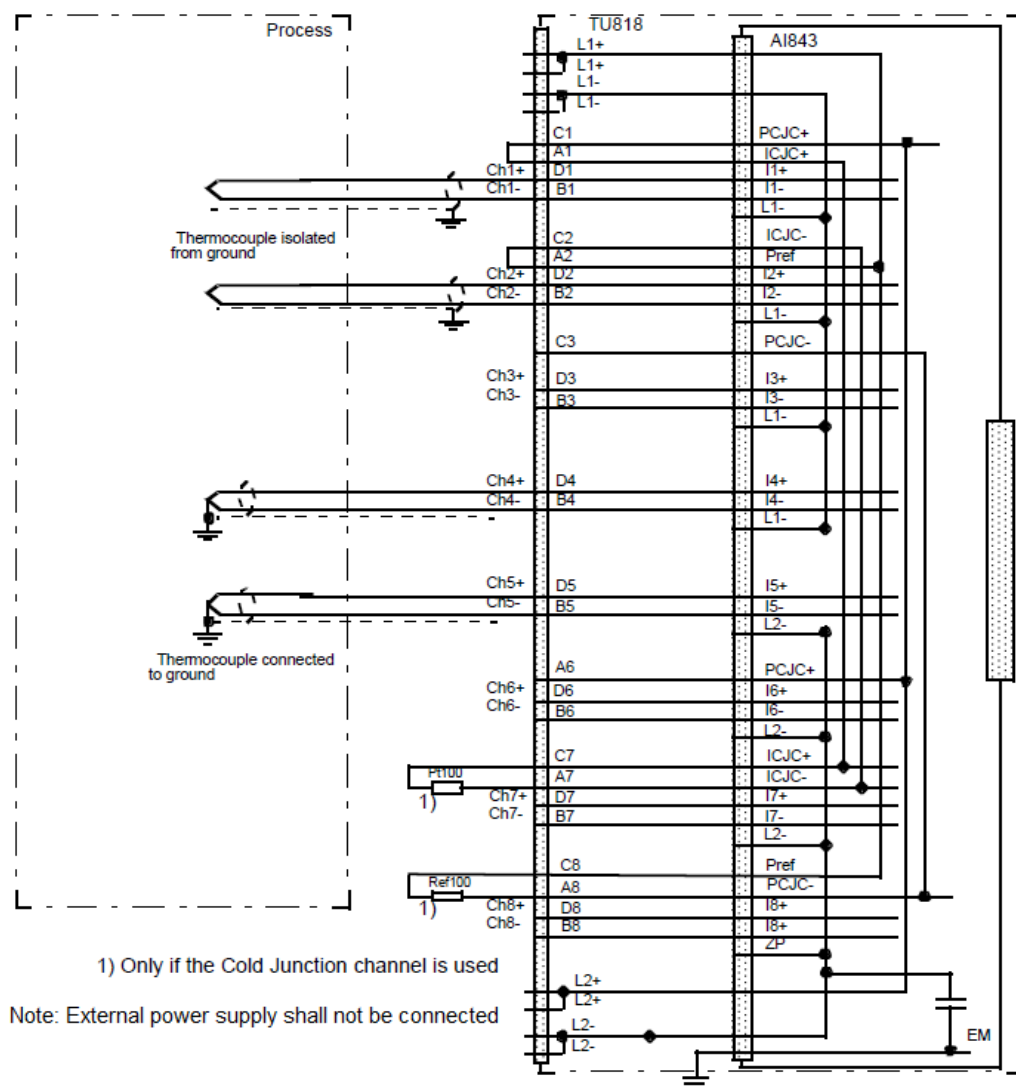


Figure 49. AI843 with TU818 Compact MTU Process Connections

Figure 50 shows the process connections for the Thermocouple/mV Input Module AI843 when installed on a TU852 Compact MTU.

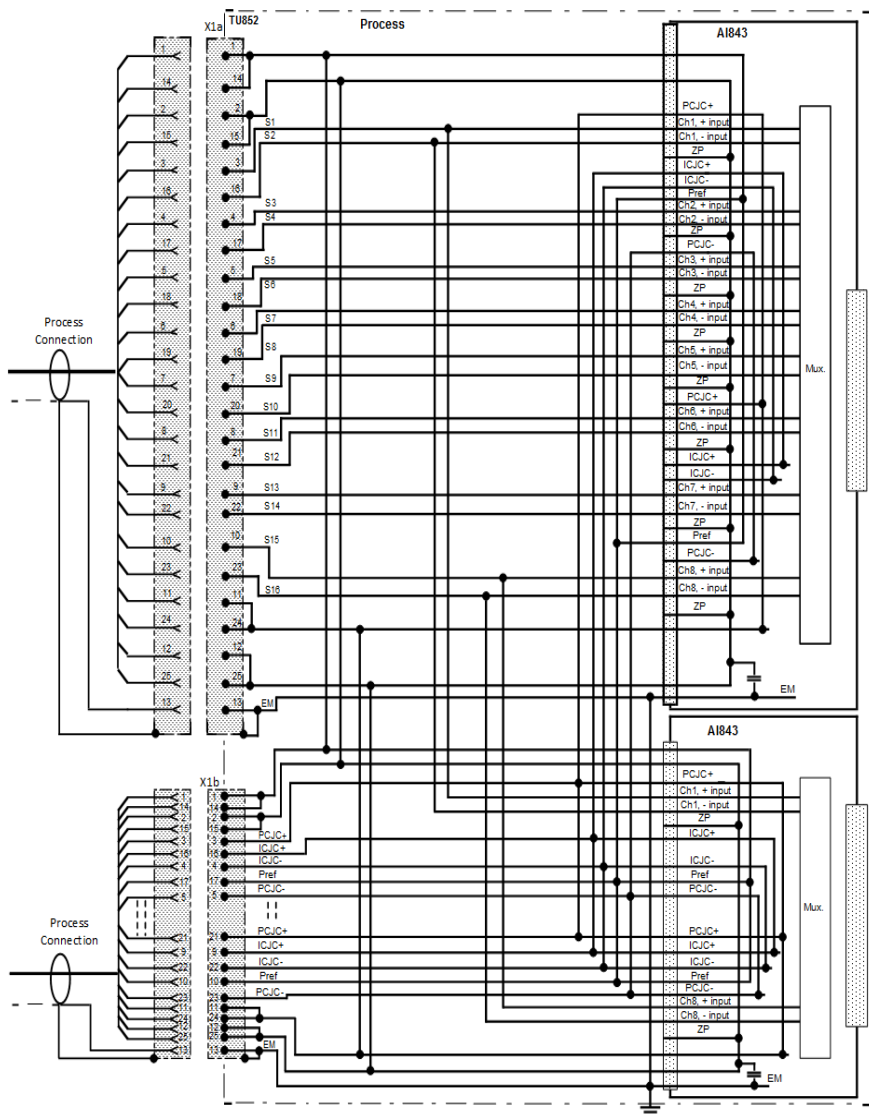


Figure 50. AI843 with TU852 Compact MTU Process Connections

## AI845 Analog Input Module, single or redundant

### Features

- 8 channels for 0...20 mA, 4...20 mA, 0...5 V or 1...5 V d.c., single ended unipolar inputs.
- Single or redundant operation.
- 1 group of 8 channels isolated from ground.
- 12 Bit resolution.
- Current limited transmitter supply per channel.
- Advanced on-board diagnostics.
- HART pass-through communication.

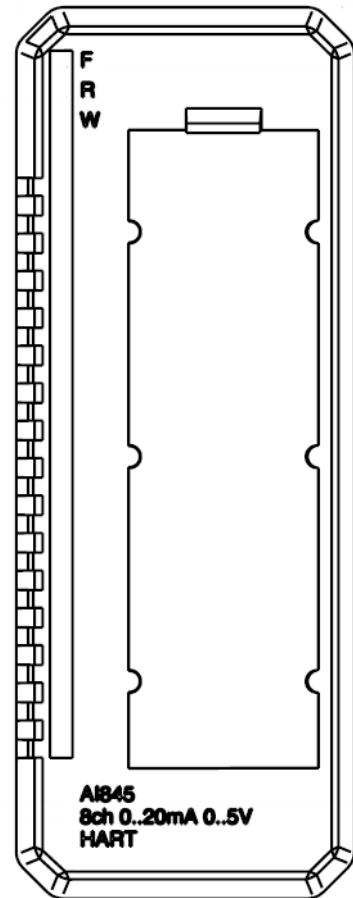
### Description

The AI845 Analog Input Module for single or redundant applications. The module has 8 channels. Each channel can be either a voltage or current input when MTU TU844 or TU845 is used, when other MTUs are used all channels become voltage or current inputs.

The voltage and current input is able to withstand an overvoltage or undervoltage of at least 11 V d.c. The input resistance for voltage input is greater than 10 M ohm and the input resistance for current input is 250 ohm.

The module distributes the external HART compatible transmitter supply to each channel. This adds a simple connection to distribute the supply to 2-wire or 3-wire transmitters. The transmitter power is supervised and current limited.

If an external power supply is used for feeding HART transmitters, the power supply must be HART compatible.





The module performs self-diagnostics cyclically. Module diagnostics include:

- External power supply, Transmitter power and External shunt error. Error in these are reported as External channel error.
- Low Pass Filter, Multiplexer and Test channels. Error in these are reported as Internal channel error.
- Analog Read Back, Reference Voltage, Internal Power Supply, Checksum, Watchdog and Memory. Error in these are reported as Module Error.

All eight channels are isolated from the ModuleBus in one group. Power to the input stages is converted from the 24 V on the ModuleBus.

The module has HART pass-through functionality. Only point-to-point communication is supported.

Eight different types of MTUs can be used for single applications. The TU830/TU833 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage inputs, but requires external terminals for distribution of 24 V power supply to the field devices. The extended MTU, TU835, and TU838 provides a fuse (3 A max.) per channel for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. The TU818 Compact MTU provides connection to 2-wire sensors without external marshaling.

Three types of MTUs can be used for redundant applications, two for mounting on a horizontal DIN rail and one for mounting on a vertical DIN rail.

Shielded field cables for process connections are required if HART is used.

The parameter Shunt mode should be set to External shunt when the MTU TU844/TU845/TU854 is used or when voltage inputs is required for other MTU.

It is only possible to mix voltage and current input when TU844/TU845/TU854 is used; for other MTUs, all channels become voltage or current inputs.

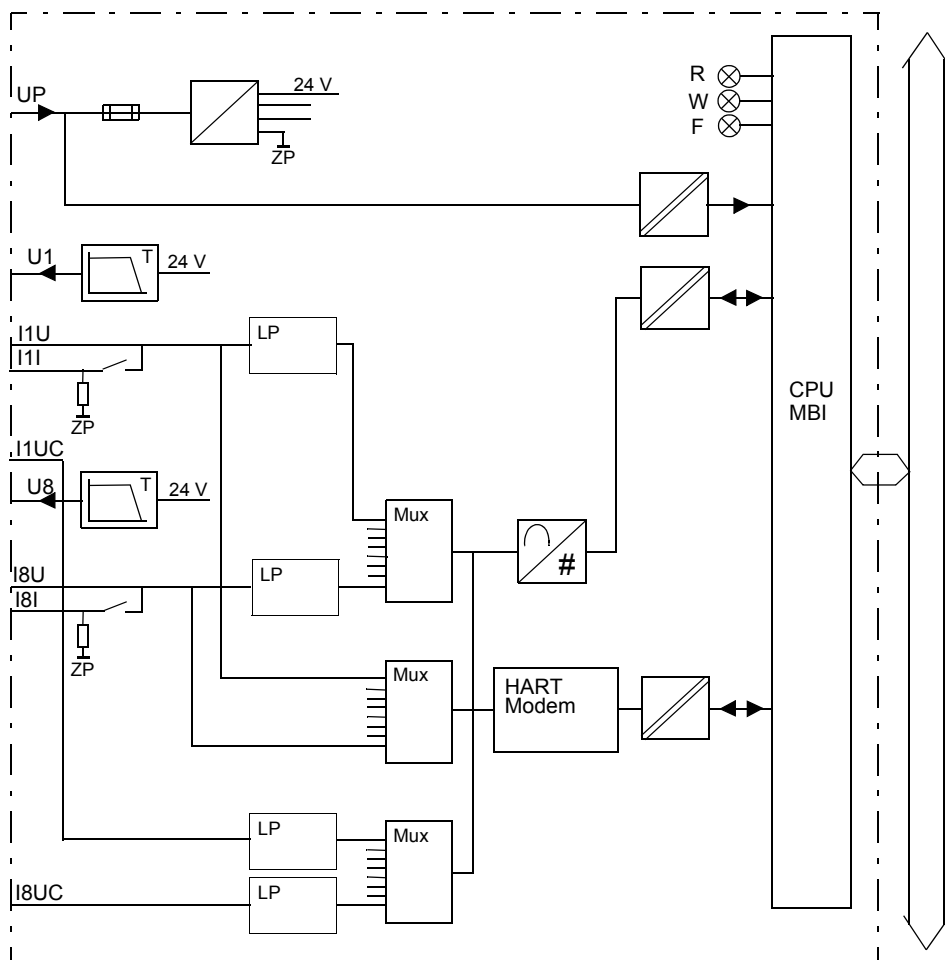
**Technical Data***Table 29. AI845 Analog Input Module Specifications at 25°C*

<b>Feature</b>	<b>AI845 Analog Input Module</b>
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA, 0...5 V, 4... 20 mA, 1... 5V
Over range	+15%
Input impedance (at voltage input)	10 M $\Omega$
Input impedance (at current input) (including PTC)	250 $\Omega$
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	11 V d.c.
NMRR, 50 Hz, 60 Hz	>40 dB
Error	Max. 0.1%
Resolution	12 bit
Temperature drift	Max. 50 ppm/°C
Update cycle time	10 ms
Current consumption 24 V (Modulebus)	50 mA
Current consumption 5 V (Modulebus)	100 mA
Current consumption 24 V (process power supply, UPx)	265 mA (max) (22 mA + transmitter current*1.32)

Table 29. AI845 Analog Input Module Specifications at 25°C (Continued)

Feature	AI845 Analog Input Module
Power dissipation	3.5 W
Transmitter supply (per channel):	+ - 10% <sup>(1)</sup> HART compatible Voltage: 24 V @ 23 mA Current: 30 mA
Supervision	Module error if: analog read back, reference voltage, internal power supply, checksum, watchdog and memory error Internal channel error if: low pass filter, multiplexer and test channels error External channel error if: external power supply low, transmitter power and external shunt error
Input filter (rise time 0-90%)	290 ms
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU835, TU838, TU844 or TU845 and TU854
MTU keying code	CC
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) If the transmitter need more current to start up, use external power for the transmitter.

**Block Diagram AI845***Figure 51. AI845 Block Diagram*

**Process Connections**

With HART signals shielded cables should be used for current process connections.

*Table 30. AI845 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal	TU844 TU845 Terminal (2)	TU854 Terminal (2)
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)	L1+	1, 14
0 V d.c. (ZP)	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1- (2)	L1-	2, 15
U1	-	-	C1	B1	11 (F1)	A1 (F1)	B1	3
Ch1, Voltage Input	C1	3	D1	C1	-	B1	B2	16
Ch1, Current Input	B1	16	B1	C2	12	B2	B2	16
Ch1, Return (ZP)	A1	-	-	A1, A2	-	A2	A1,A2	-
U2	-	-	C2	B3	21 (F2)	A3 (F2)	B3	4
Ch 2, Voltage Input	C2	4	D2	C3	-	B3	B4	17
Ch 2, Current Input	B2	17	B2	C4	22	B4	B4	17
Ch 2, Return (ZP)	A2	-	-	A3, A4	-	A4	A3, A4	-
U3	-	-	C3	B5	31 (F3)	A5 (F3)	B5	5

Table 30. AI845 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal	TU844 TU845 Terminal (2)	TU854 Terminal (2)
Ch 3, Voltage Input	C3	5	D3	C5	-	B5	B6	18
Ch 3, Current Input	B3	18	B3	C6	32	B6	B6	18
Ch 3, Return (ZP)	A3	-	-	A5, A6	-	A6	A5, A6	-
U4	-	-	C4	B7	41 (F4)	A7 (F4)	B7	6
Ch 4, Voltage Input	C4	6	D4	C7	-	B7	B8	19
Ch 4, Current Input	B4	19	B4	C8	42	B8	B8	19
Ch 4, Return (ZP)	A4	-	-	A7, A8	-	A8	A7, A8	-
U5	-	-	C5	B9	51 (F5)	A9 (F5)	B9	7
Ch 5, Voltage Input	C5	7	D5	C9	-	B9	B10	20
Ch 5, Current Input	B5	20	B5	C10	52	B10	B10	20
Ch 5, Return (ZP)	A5	-	-	A9, A10	-	A10	A9, A10	-

Table 30. AI845 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal	TU844 TU845 Terminal (2)	TU854 Terminal (2)
U6	-	-	C6	B11	61 (F6)	A11 (F6)	B11	8
Ch 6, Voltage Input	C6	8	D6	C11	-	B11	B12	21
Ch 6, Current Input	B6	21	B6	C12	62	B12	B12	21
Ch 6, Return (ZP)	A6	-	-	A11, A12	-	A12	A11, A12	-
U7	-	-	C7	B13	71 (F7)	A13 (F7)	B13	9
Ch 7, Voltage Input	C7	9	D7	C13	-	B13	B14	22
Ch 7, Current Input	B7	22	B7	C14	72	B14	B14	22
Ch 7, Return (ZP)	A7	-	-	A13, A14	-	A14	A13, A14	-
U8	-	-	C8	B15	81 (F8)	A15 (F8)	B15	10
Ch 8, Voltage Input	C8	10	D8	C15	-	B15	B16	23
Ch 8, Current Input	B8	23	B8	C16	82	B16	B16	23

Table 30. AI845 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal	TU844 TU845 Terminal (2)	TU854 Terminal (2)
Ch 8, Return (ZP)	A8	-	-	A15, A16	-	A16	A15, A16	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)	L2+	11, 24
0 V d.c. (ZP)	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2- (2)	L2-	12, 25

(1) Pin 13 connected to connector body for EM.

(2) Voltage or current input chosen by the shunt stick on TU844/TU845/TU854.



Figure 52 shows the process connections for the Analog Input Module AI845 when installed on a TU830/TU833 Extended MTU.

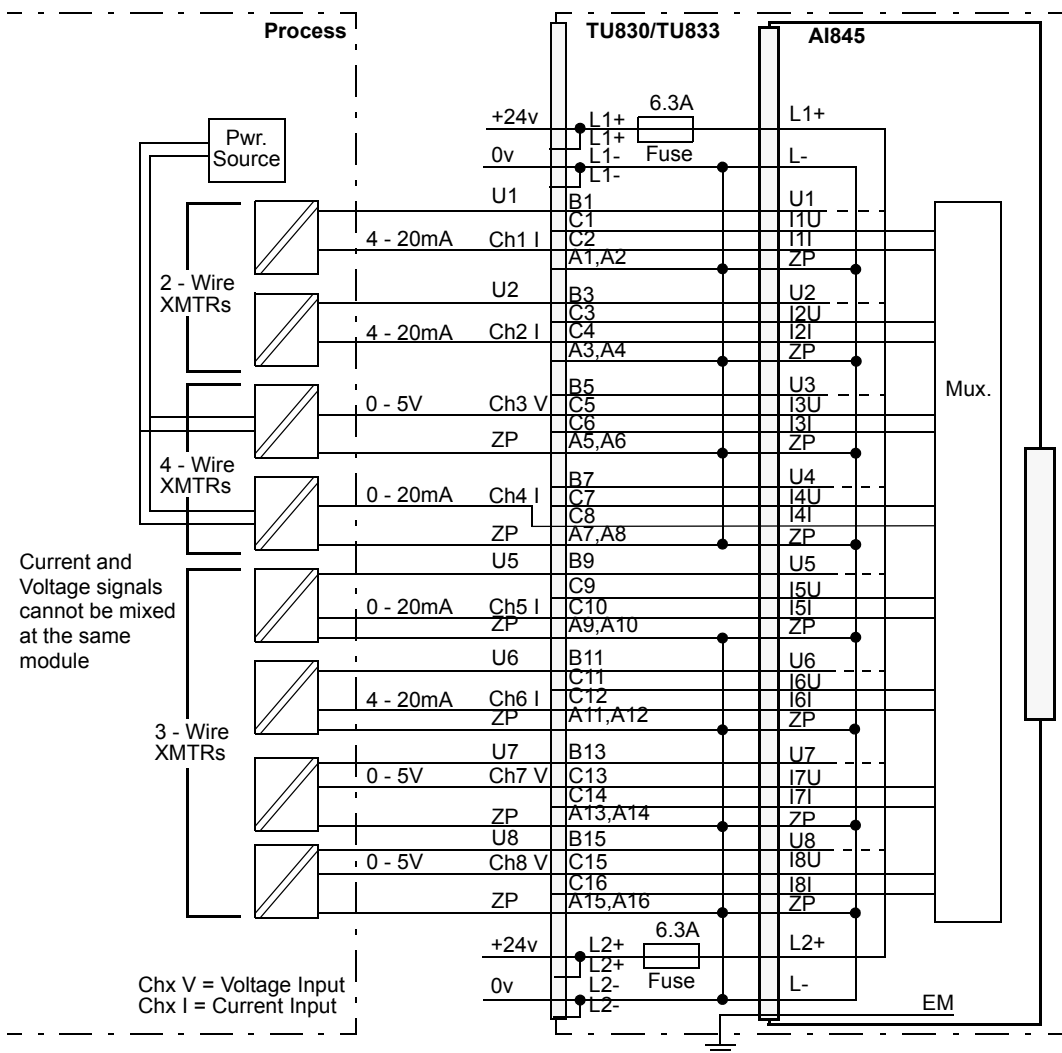


Figure 52. AI845 with TU830/TU833 Extended MTU Process Connections

Figure 53 shows the process connections for the Analog Input Module AI845 when installed on a TU835 Extended MTU.

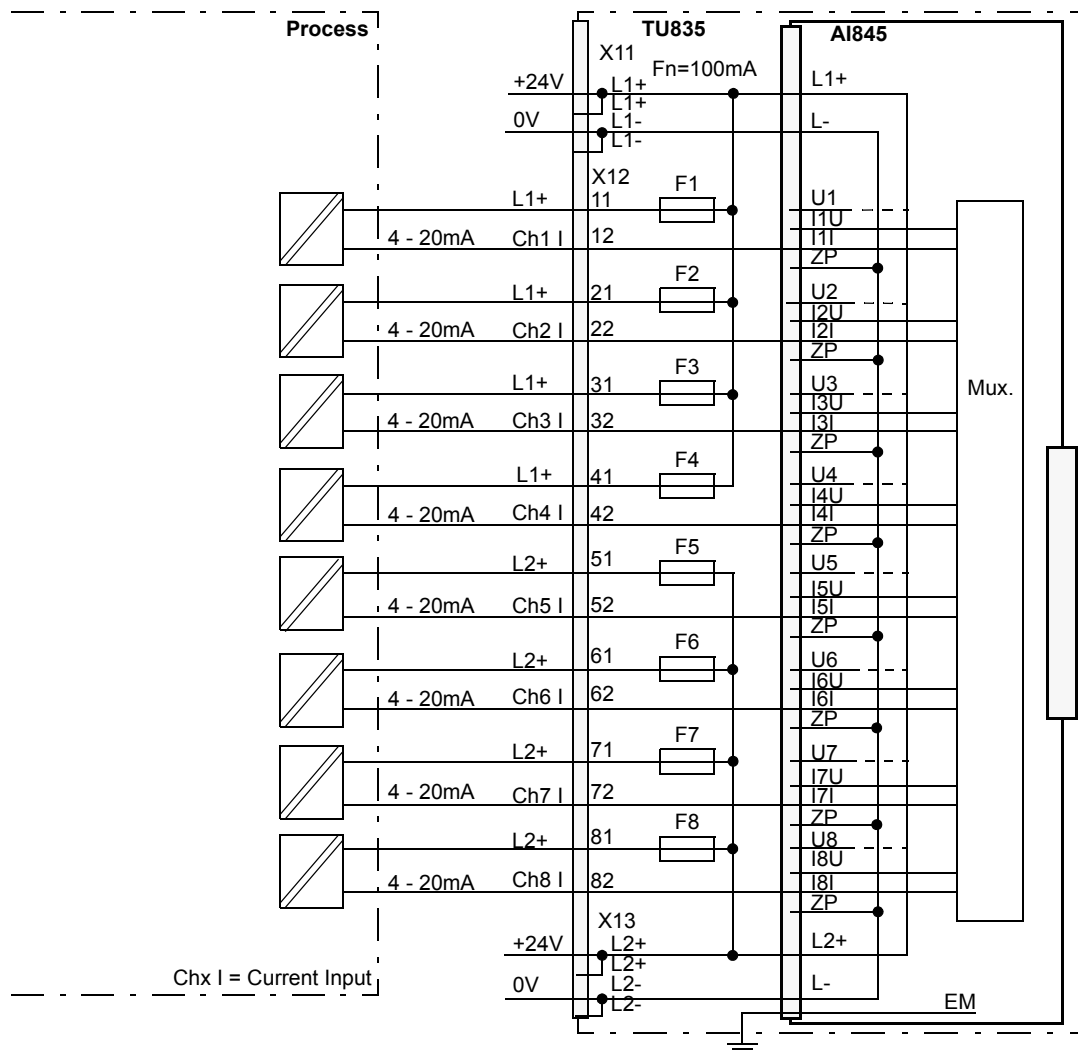


Figure 53. AI845 with TU835 Extended MTU Process Connections

Figure 54 shows the process connections for the Analog Input Module AI845 when installed on a TU838 Extended MTU.

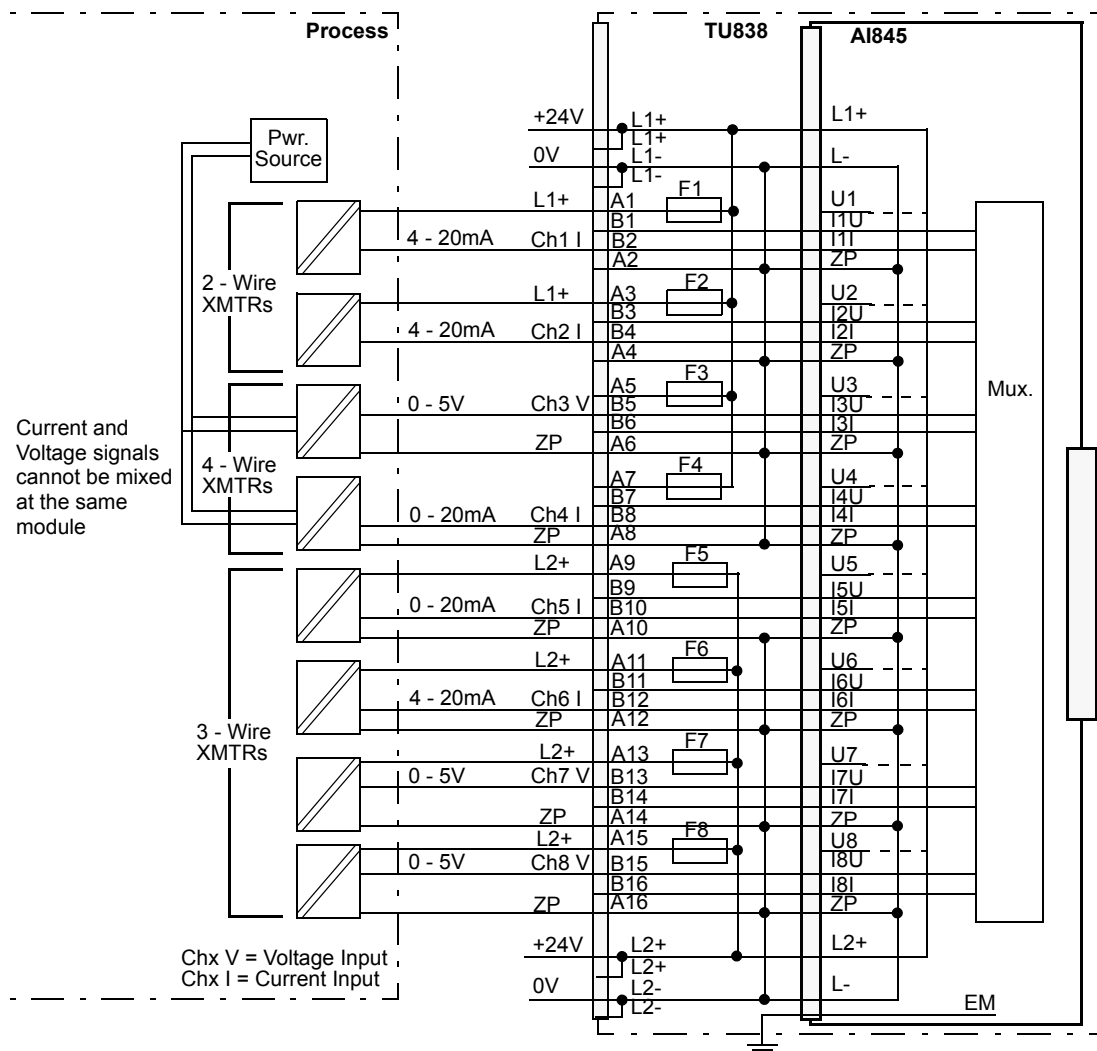


Figure 54. AI845 with TU838 Extended MTU Process Connections

Figure 55 shows the process connections for the Analog Input Module AI845 when installed on a TU810 or TU814 Compact MTU.

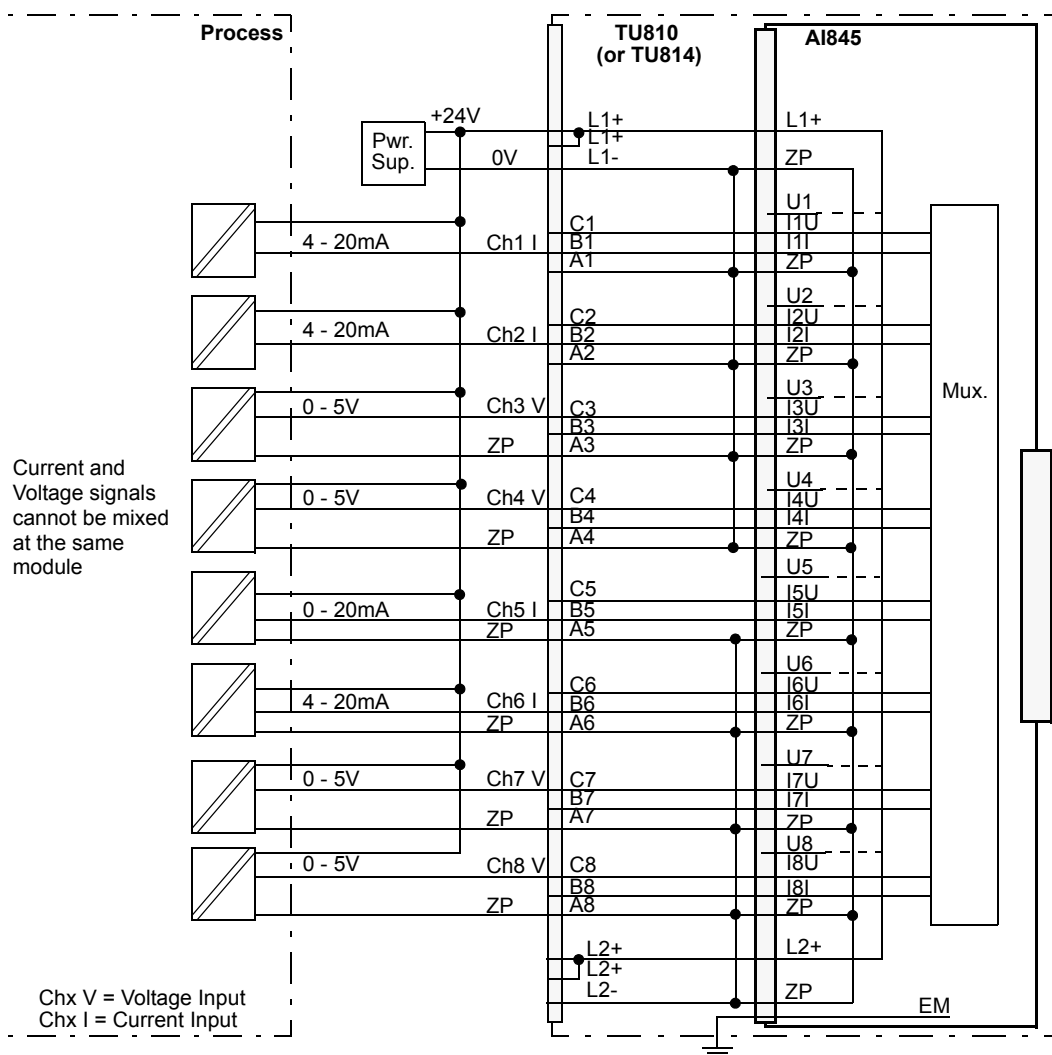


Figure 55. AI845 with TU810 or TU814 Compact MTU Process Connections

Figure 56 shows the process connections for the Analog Input Module AI845 when installed on a TU812 Compact MTU.

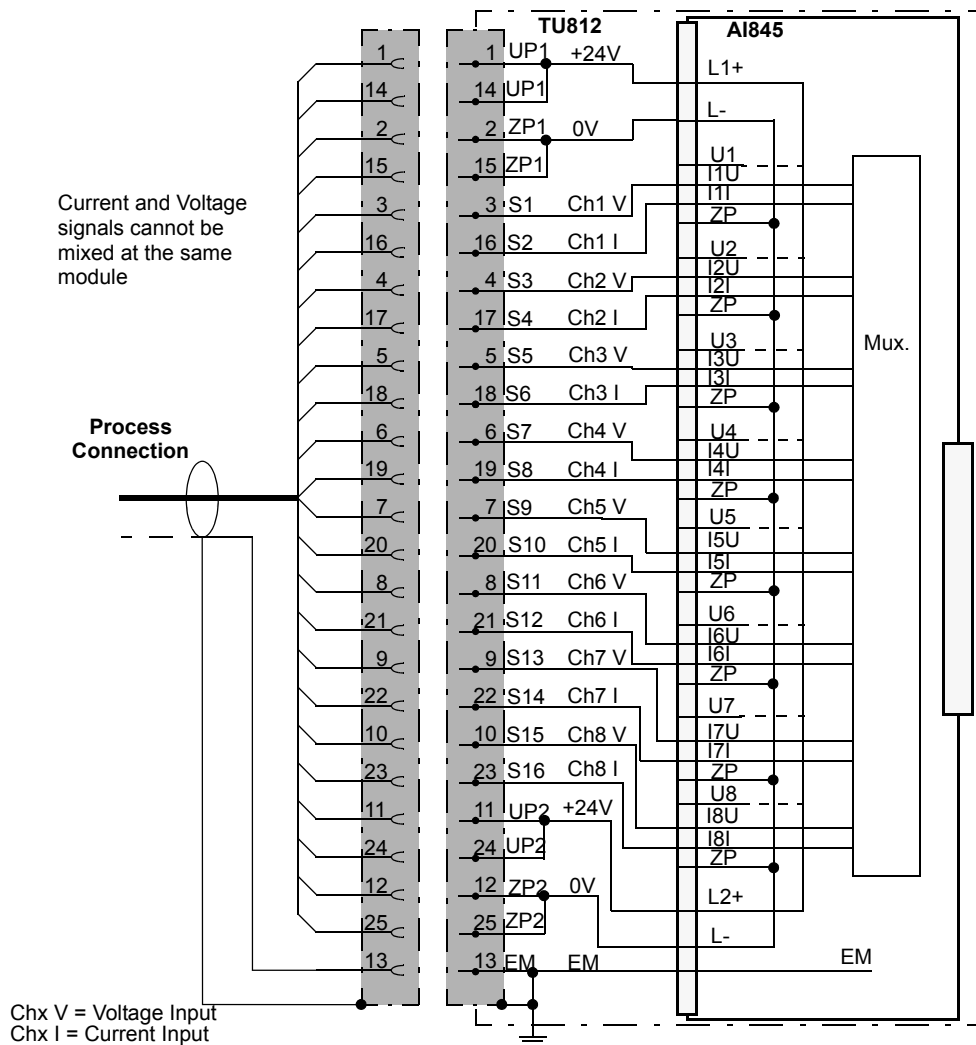


Figure 56. AI845 with TU812 Compact MTU Process Connections

Figure 57 shows the process connections for the Analog Input Module AI845 when installed on a TU844 or TU845 Redundant MTU.

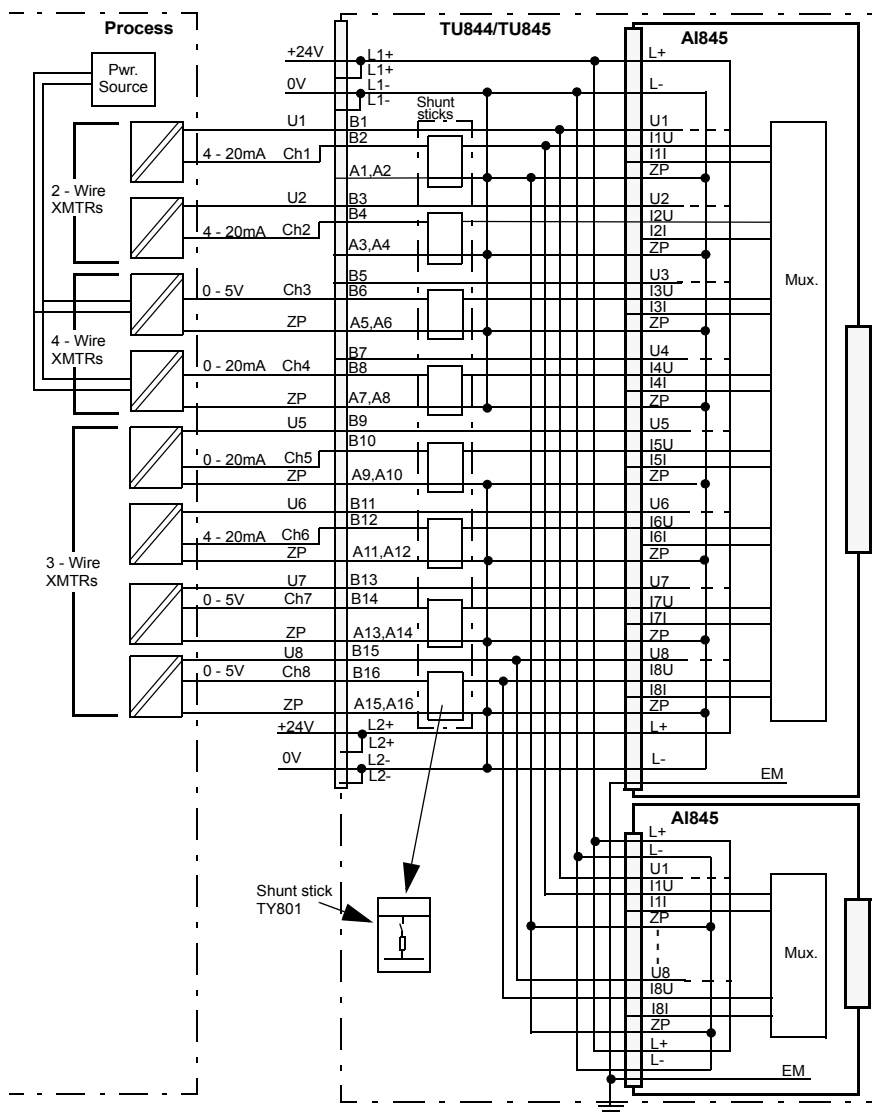


Figure 57. AI845 with TU844 or TU845 Redundant MTU Process Connections

Figure 58 shows the process connections for the Analog Input Module AI845 when installed on a TU818 Compact MTU.

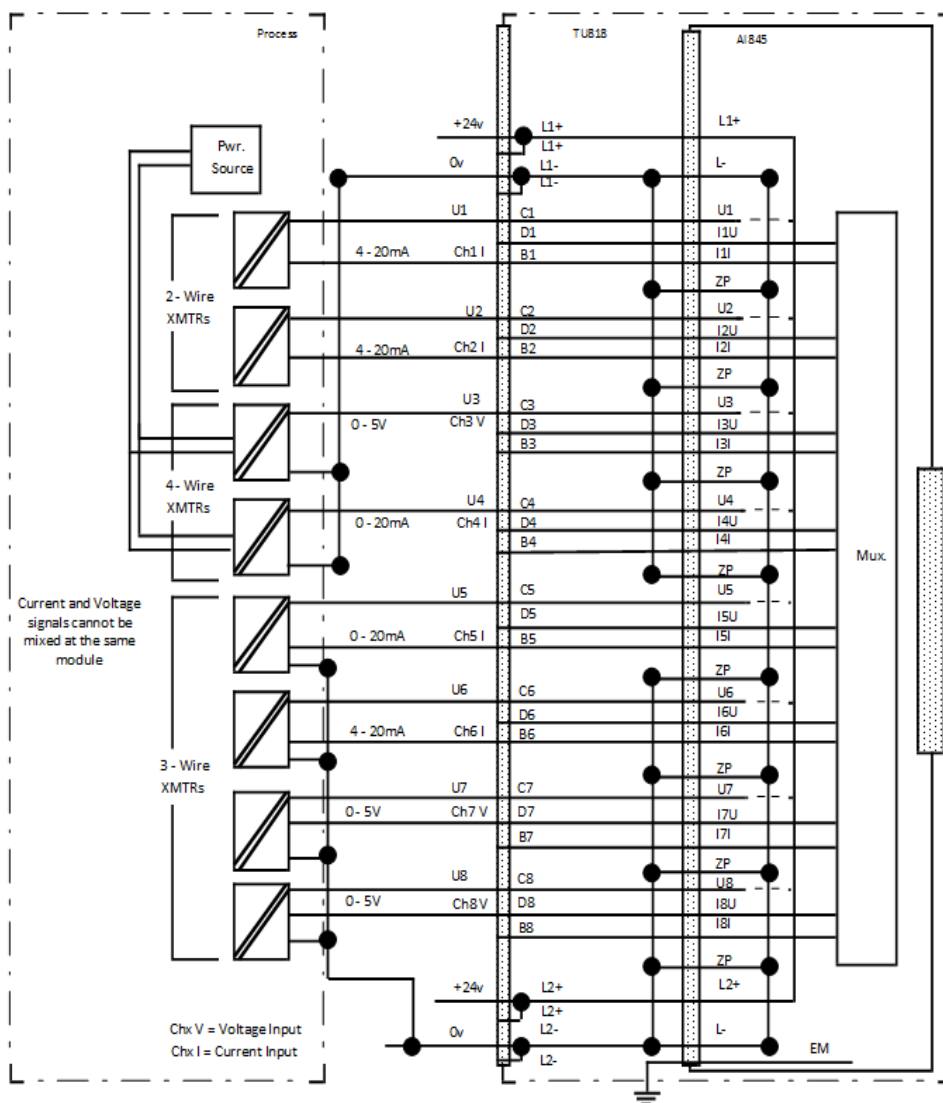


Figure 58. AI845 with TU818 Compact MTU Process Connections

Figure 59 shows the process connections for the Analog Input Module AI845 when installed on a TU854 Redundant Horizontal MTU.

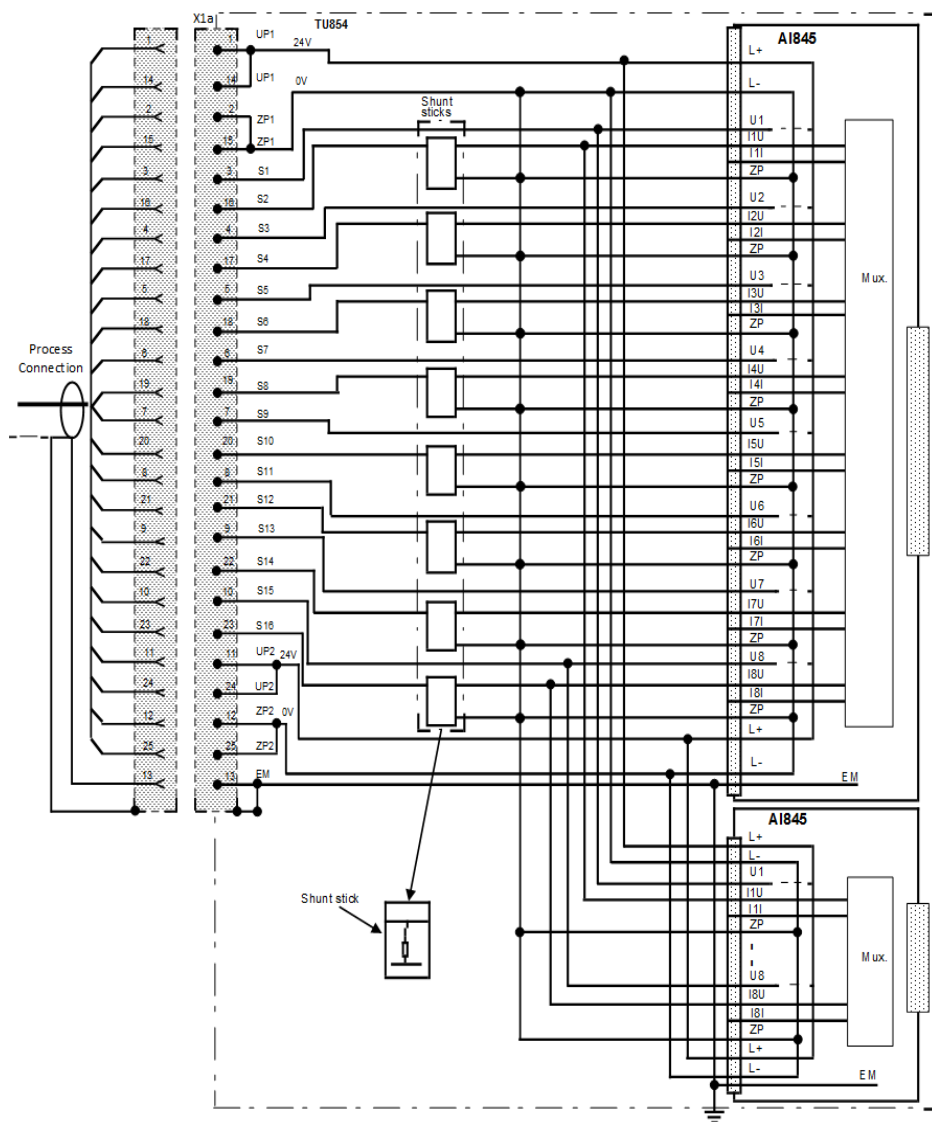


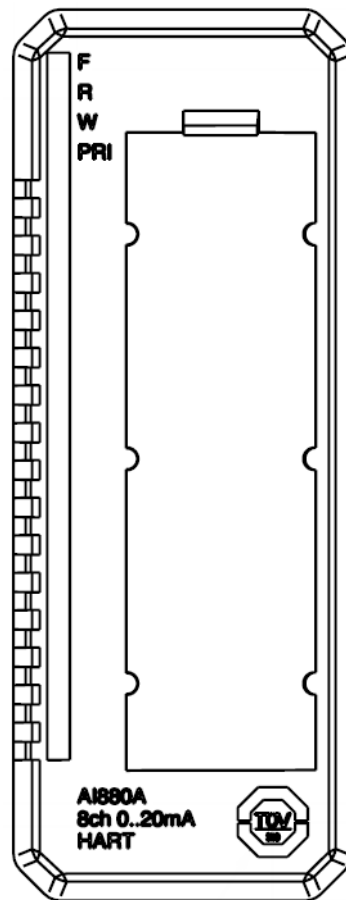
Figure 59. AI845 with TU854 Redundant Horizontal MTU Process Connections



## AI880/AI880A High Integrity Analog Input Module

### Features

- 8 channels for 0...20 mA, 4...20 mA, single ended unipolar inputs.
- Single or redundant configuration.
- 1 group of 8 channels isolated from ground.
- 12 bit resolution.
- Loop Supervised DI function.
- Configurable alarm limit for field power outputs.
- Configurable over/under range for current inputs.
- Current limited transmitter supply per channel.
- Advanced on-board diagnostics.
- Certified for SIL3 according to IEC 61508.
- Certified for Category 4 according to EN 954-1.
- Complies with the NAMUR recommendation NE43, and supports configurable over- and under range limits.
- HART pass-through communication (AI880A).



### Description - AI Function

The AI880/AI880A High Integrity Analog Input Module is designed for single and redundant configuration. The module has 8 current input channels.

The input resistance is 250 ohm.

The module distributes the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2- or 3-wire transmitters. The transmitter power is supervised and current limited.

All eight channels are isolated from the ModuleBus in one group. Power to the Module is generated from the 24 V on the ModuleBus.

The AI880/AI880A complies with the NAMUR recommendation NE43, and supports configurable over- and under range limits.

As AI880/AI880A needs external shunt sticks, the MTUs TU844, TU845 or TU854 is required for redundant configurations and TU834 for single configurations.

AI880A has HART pass-through functionality. Only point-to-point communication is supported.

Sensors should be for 24 V power supply if it should be powered from the module.

Shielded field cables are required for process connections.

### Description - Loop Supervised DI Function

AI880/AI880A can be configured for the function Loop Supervised Digital Input. When used as Loop Supervised, the I/O module can handle input signals with defined levels for open circuit, logic low state, logic high state, and short circuit.

The function, Loop Supervised DI, is also used with field devices without defined levels for field loop diagnostics, if an additional resistor network is added.



The resistor network is considered to be a part of the field device; this **must** be considered when certifying a safety loop according to IEC 61511.

The resistor network should be placed close to the field device.

When using the function, Loop Supervised DI, the following parameter settings and field loop arrangement (resistor network) should be used:

1. Interfacing to signals from mechanical contact switching devices.

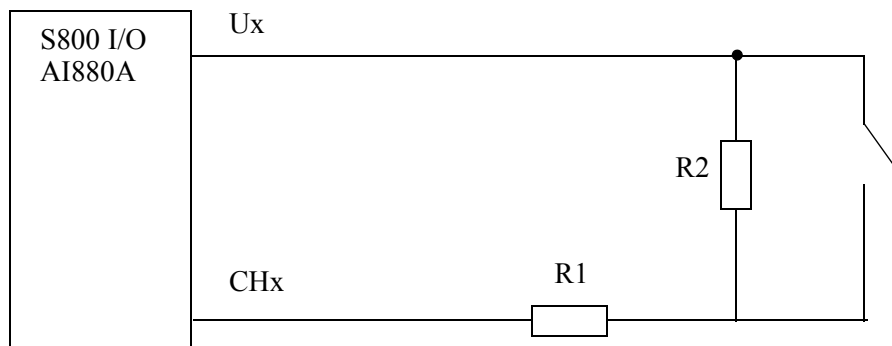


Figure 60. Field Loop Arrangement When using the function Loop Supervised DI

Type of setting	Setting	Value
Parameter	Limit for change false – true ch No	4.2 mA
Parameter	Open circuit alarm level channel No.	1.0 mA
Resistor	R1	2.7 k ohm <sup>(1)</sup>
Resistor	R2	10 k ohm <sup>(1)</sup>

(1) In general, resistors must have the following rating: resistance tolerance 5% or better, power rating 0.5W or more.

## 2. Interfacing to signals from 2-wire proximity switches.

In general, Loop Supervised DI supports 2-wire proximity switches with:

- Leakage current (off state) < 1.5mA.
- Voltage drop (on state) < 8V.

Type of setting	Setting	Value
Parameter	Limit for change false – true ch No	4.2 mA
Parameter	Open circuit alarm level channel No.	1.0 mA
Resistor	R1	1.5 k ohm <sup>(1) (2)</sup>
Resistor	R2	10 k ohm <sup>2</sup>

(1) For field supplies ( $U_{in}$ ) below 21.6 V, R1 must be 1.0 k ohm instead of 1.5 k ohm.

(2) In general, resistors must have the following rating: resistance tolerance 5% or better, power rating 0.5 W or more.

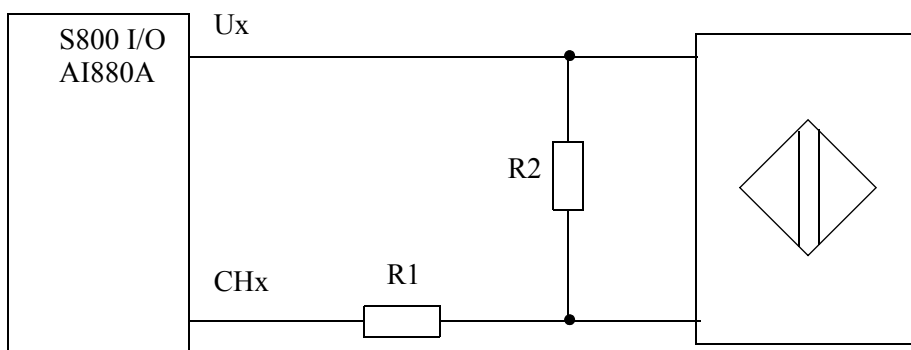


Figure 61. Field Loop Arrangement



For applications where a field loop error shall not lead to immediate trip, the input value must be delayed with (at least) 200ms. This delay should be implemented in the application program. The delay is needed since the input value may change state a short time before the field loop error is detected.

### Self-diagnostic functions

- Errors in External power supply and External shunt error are reported as External channel error.
- Errors in Low Pass Filter, and Test channels are reported as channel error.
- Errors in Analog to Digital converters, Multiplexer, Analog references, Internal power supplies, Errors in micro controller, FPGA and Memory are reported as Module Error.

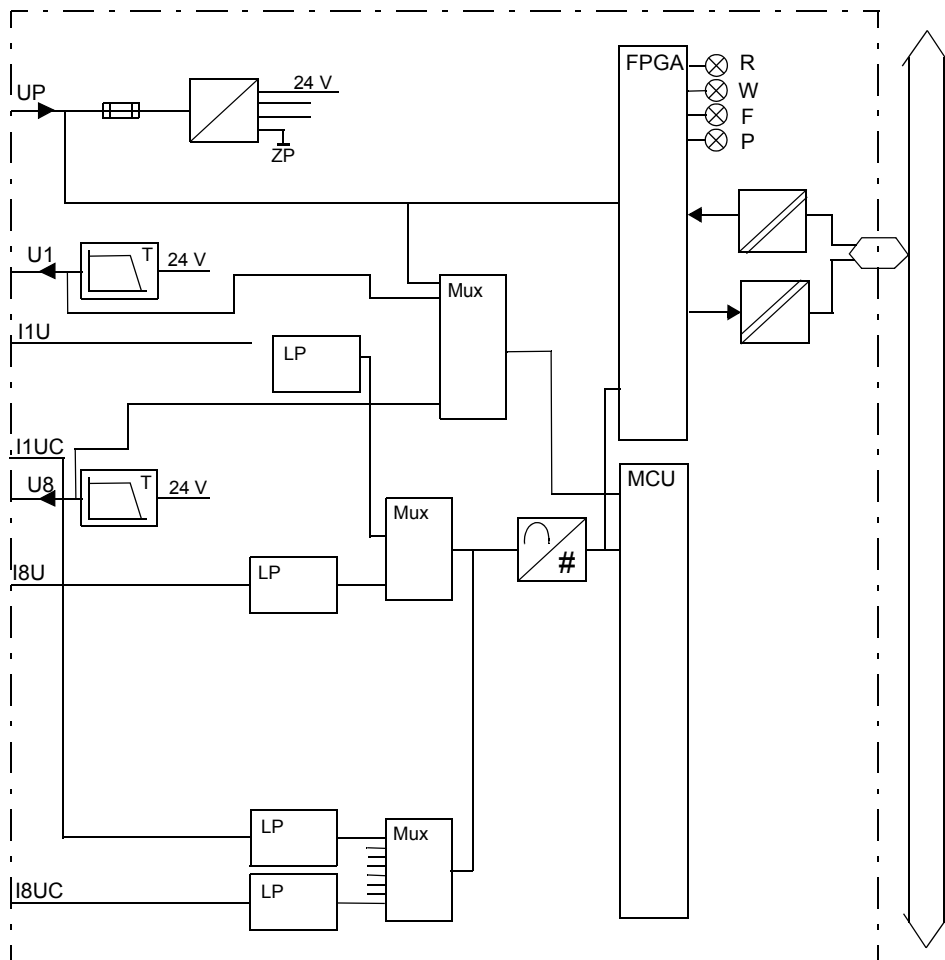
**Technical Data***Table 31. AI880/AI880A High Integrity Analog Input Module Specifications at 25°C*

<b>Feature</b>	<b>AI880 High Integrity Analog Input Module</b>
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA 4... 20 mA
Over range	+12% (0...20mA) +15% (4...20mA)
Input impedance (at current input)	250 $\Omega$ (with Shunt stick TY801)
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	11 V d.c.
NMRR, 50 Hz, 60 Hz	>40 dB
Error	$\leq 0.1\%$
Safety accuracy	1.9% (configurable 0.6-5%)
Resolution	12 bit
Temperature drift	Max. 50 ppm/°C
Update cycle time	10 ms
Current consumption 24 V (Modulebus)	50 mA (max)
Current consumption 5 V (Modulebus)	45 mA
Current consumption 24 V (process power supply, UPx)	260 mA (max) (4 + transmitter current)
Power dissipation	2.4 W

*Table 31. AI880/AI880A High Integrity Analog Input Module Specifications at 25°C (Continued)*

Feature	AI880 High Integrity Analog Input Module
Transmitter supply (per channel):	Hart Compatible Voltage: Process power supply (U <sub>px</sub> ) - max 4.5 V Current: 32 mA + - 10% <sup>(1)</sup>
Voltage supervision	Internal voltage, field power input, field power output per channel
Input filter rise time (0-90%)	190 ms (HW filter)
Isolation	8 inputs isolated from ground in one group
Module termination units	TU834 (single) TU844, TU845, TU854 (redundant)
MTU keying code	FF (AI880), FD (AI880A)
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) If the transmitter need more current to start up, use external power for the transmitter

**Block Diagram AI880/AI880A***Figure 62. AI880/AI880A Block Diagram*

### Process Connections

Shielded cables<sup>A</sup> should be used for process connections (over all shield is sufficient if a multi core cable contains sorted signal types).

Table 32. AI880/AI880A Process Connections

Process Connection	TU834 TU844 TU845 Terminal	TU854 Terminal
+24 V d.c.	L1+	1, 14
0 V d.c. (ZP)	L1-	2, 15, 12, 25
U1	B1	3
Ch1, Current Input	B2	16
Ch1, Return (ZP)	A1,A2	-
U2	B3	4
Ch 2, Current Input	B4	17
Ch 2, Return (ZP)	A3, A4	-
U3	B5	5
Ch 3, Current Input	B6	18
Ch 3, Return (ZP)	A5, A6	-
U4	B7	6
Ch 4, Current Input	B8	19
Ch 4, Return (ZP)	A7, A8	-
U5	B9	7
Ch 5, Current Input	B10	20
Ch 5, Return (ZP)	A9, A10	-

A. For use without shielded cables, see *Technical Description 3BSE070238*



*Table 32. AI880/AI880A Process Connections (Continued)*

<b>Process Connection</b>	<b>TU834 TU844 TU845 Terminal</b>	<b>TU854 Terminal</b>
U6	B11	8
Ch 6, Current Input	B12	21
Ch 6, Return (ZP)	A11, A12	-
U7	B13	9
Ch 7, Current Input	B14	22
Ch 7, Return (ZP)	A13, A14	-
U8	B15	10
Ch 8, Current Input	B16	23
Ch 8, Return (ZP)	A15, A16	-
0 V d.c. (ZP)	L2-	-

Figure 63 shows the process connections for the High Integrity Analog Input Module AI880/AI880A when installed on a TU844 or TU845 redundant MTU.

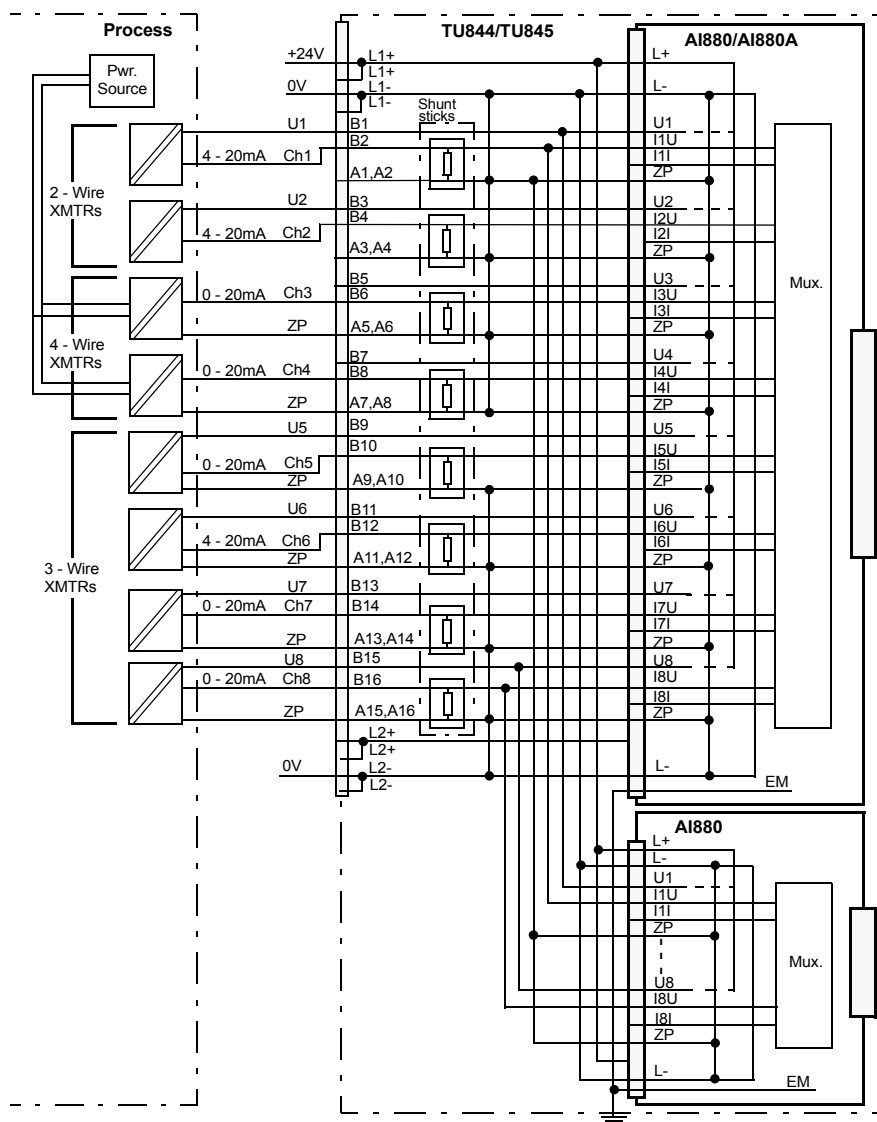


Figure 63. AI880/AI880A with TU844 or TU845 Redundant MTU Process Connections

Figure 64 shows the process connections for the High Integrity Analog Input Module AI880/AI880A when installed on a TU844 or TU845 redundant MTU and used as Loop Supervised DI.

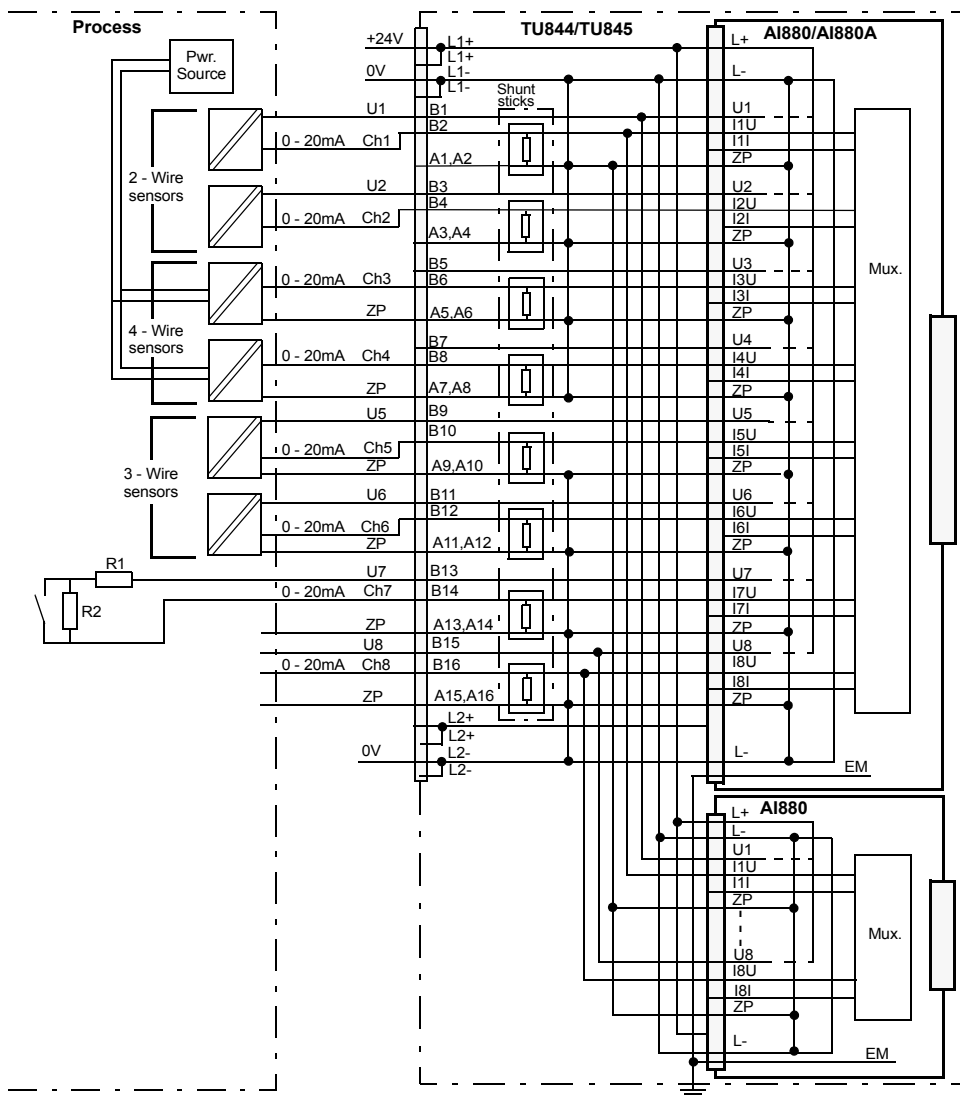


Figure 64. AI880/AI880A with TU844 or TU845 Redundant MTU Process Connections

Figure 65 shows the process connections for the High Integrity Analog Input Module AI880/AI880A when installed on a TU834 single MTU.

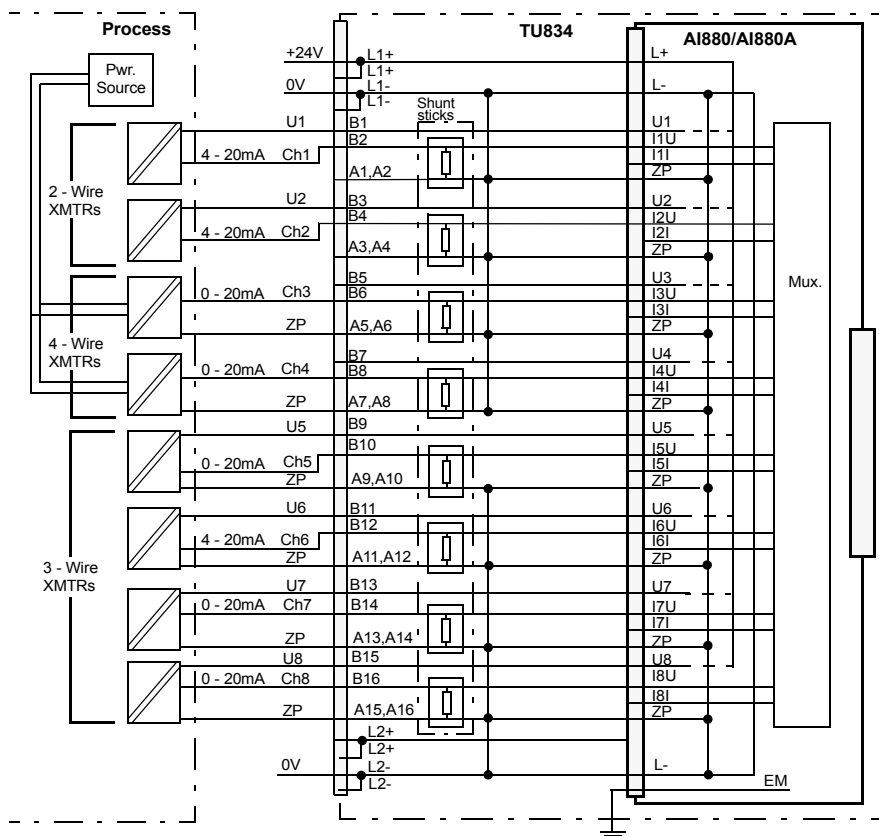


Figure 65. AI880/AI880A with TU834 Single MTU Process Connections

Figure 66 shows the process connections for the High Integrity Analog Input Module AI880/AI880A when installed on a TU834 single MTU and used as Loop Supervised DI.

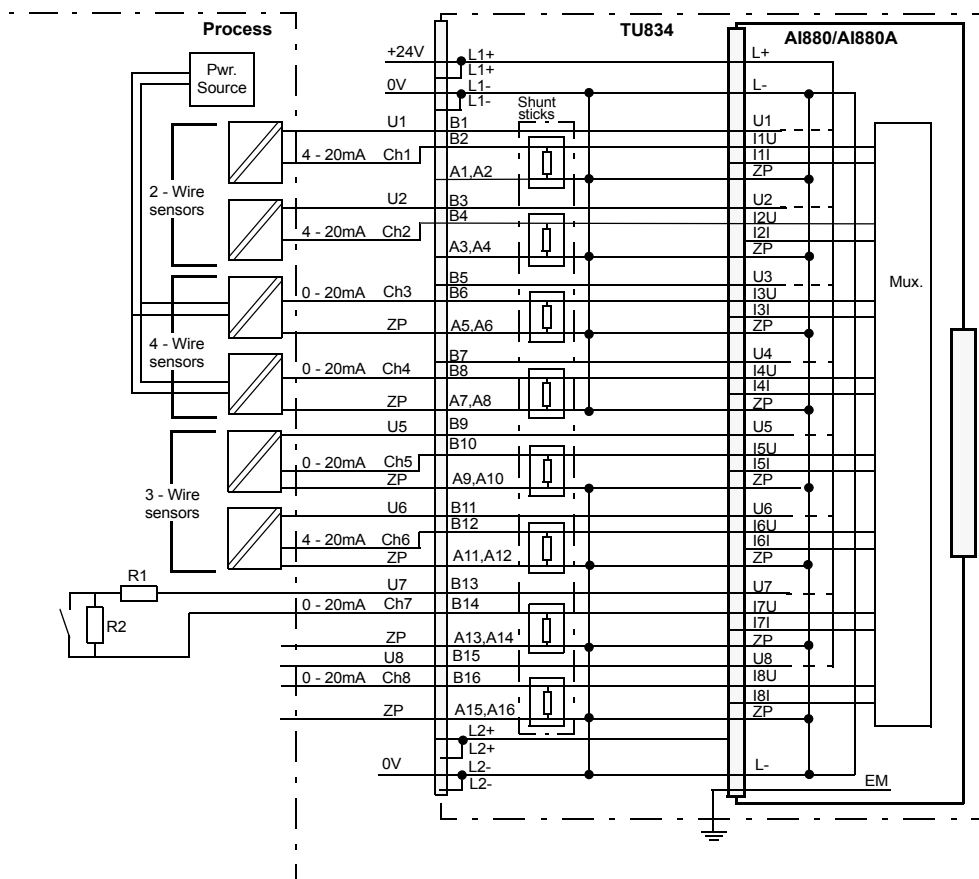


Figure 66. AI880/AI880A with TU834 Single MTU Process Connections

Figure 67 shows the process connections for the High Integrity Analog Input Module AI880A when installed on a TU854 Redundant Horizontal MTU.

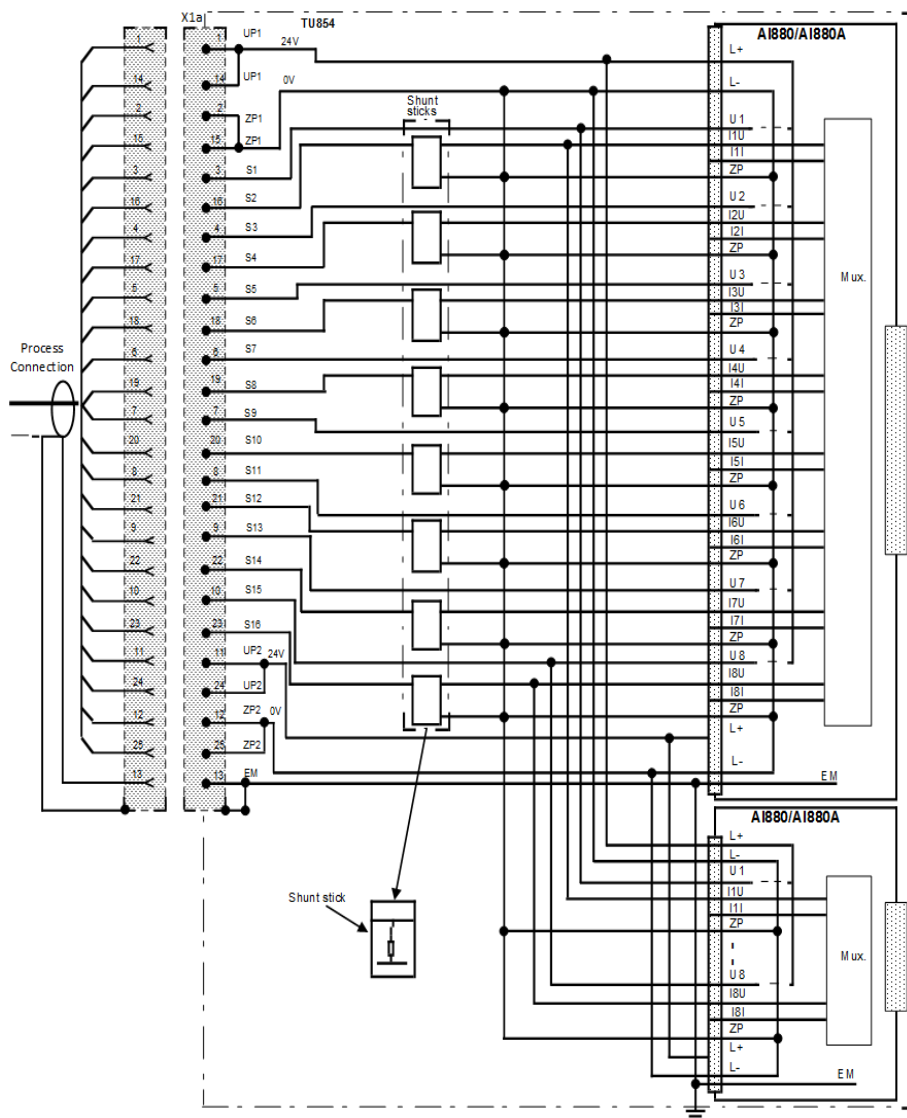


Figure 67. AI880A with TU854 Redundant Horizontal MTU Process Connections

# AO801 Analog Output Module, 0(4)...20 mA

## Features

- 8 channels of 0...20 mA, 4...20 mA outputs.
- OSP sets outputs to predetermined state upon error detection.
- Analog Output is to be short circuit secured to ZP or +24 V.
- Process and power connection via detachable connectors.

## Description

The AO801 Analog Output Module has 8 unipolar analog output channels.

The module performs self-diagnostic cyclically. A low internal power supply sets the module in INIT state (no signal from the module).

## Technical Data

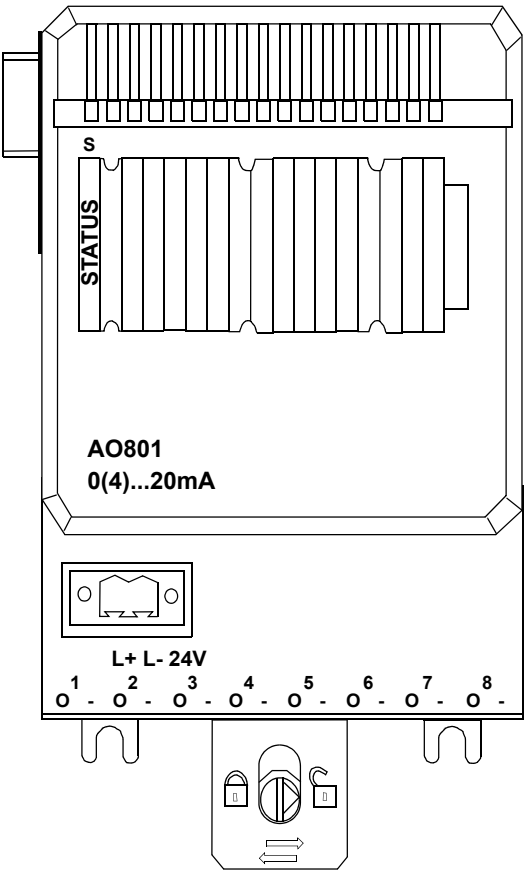


Table 33. AO801 Analog Output Module Specifications at 25°C

Feature	AO801 Analog Output Module
Number of channels	8
Output rang	0... 20mA, 4...20mA <sup>(1)</sup>

Table 33. AO801 Analog Output Module Specifications at 25°C (Continued)

Feature	AO801 Analog Output Module
Over range	15%
Output load	Max 850 ohms (external 24 V > 24 V) <sup>(2)</sup> (24 V external - 7) / 0.02 (external 24 V < 24 V)
Maximum field cable length	600 meters (656 yd.)
Rise time	10µs
Cycle time	1 ms
Error	Max. 0.1%
Resolution	12 bit
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Typ. 30 ppm/°C Max. 60 ppm/°C
Current consumption 24 V (process power supply, UPx)	200 mA (max)
Current consumption 5 V (Modulebus)	70 mA (max)
Power dissipation	3.8 W
Isolation	Groupwise isolated from ground
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm <sup>2</sup> , 30-12 AWG Stranded: 0.05-1.5mm <sup>2</sup> , 30-12 AWG Recommended torque: 0.5 - 0.6Nm Stripping length: 6-7.5 mm, 0.24-0.30 in

(1) 4...20 mA handled by the FCI or controller



- (2) See Power Dissipation Calculation below.

### Power Dissipation Calculation

If output load <250 ohms and high power supply can max. power dissipation be exceeded.

The total power dissipated in the output stages should be <1.2 W. Can be calculated according to:

UP <24 V

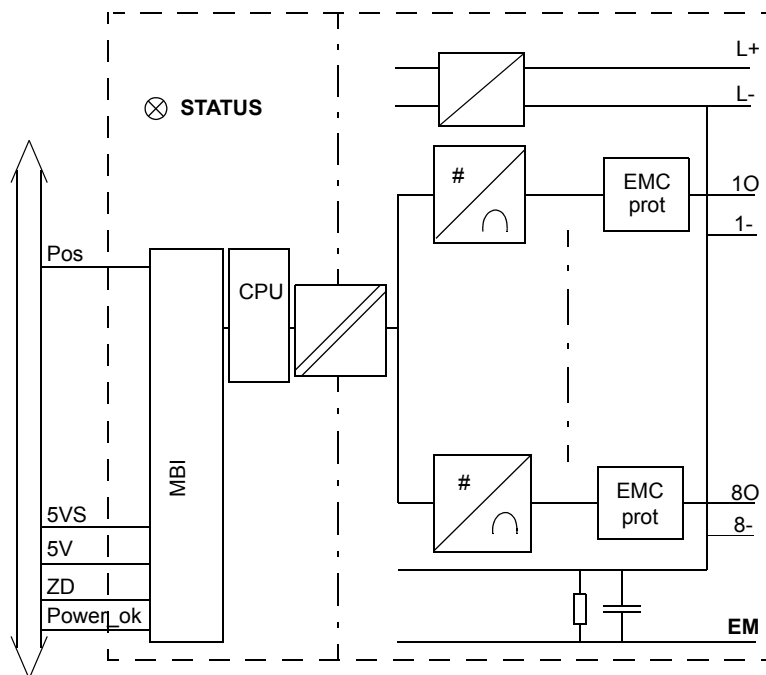
$$P_{output} = \sum_{i=1}^8 [(UP - 4.7 - (R_{Li} + 100) \times I_{CHi}) \times I_{CHi}]$$

UP >24 V

$$P_{output} = \sum_{i=1}^8 [(19.3 - (R_{Li} + 100) \times I_{CHi}) \times I_{CHi}]$$

*UP* = Power supply to the output stages  
*I<sub>CHi</sub>* = Average output current per channel  
*R<sub>Li</sub>* = Output load per channel

Temporary overload or short circuit does not cause any damage but long term overload will decrease module MTBF.

**Block Diagram AO801***Figure 68. A0801 Block Diagram*

**Process Connections***Table 34. AO801 Process Connections*

<b>Process Connection</b>	<b>Process Terminal</b>
Ch1, + Output	1O
Ch1 Return (ZP)	1-
Ch 2, + Output	2O
Ch2 Return (ZP)	2-
Ch 3, + Output	3O
Ch3 Return (ZP)	3-
Ch 4, + Output	4O
Ch4 Return (ZP)	4-
Ch 5, + Output	5O
Ch5 Return (ZP)	5-
Ch 6, + Output	6O
Ch6 Return (ZP)	6-
Ch 7, + Output	7O
Ch7 Return (ZP)	7-
Ch 8, + Output	8O
Ch8 Return (ZP)	8-

Figure 69 shows the process connections for the AO801.

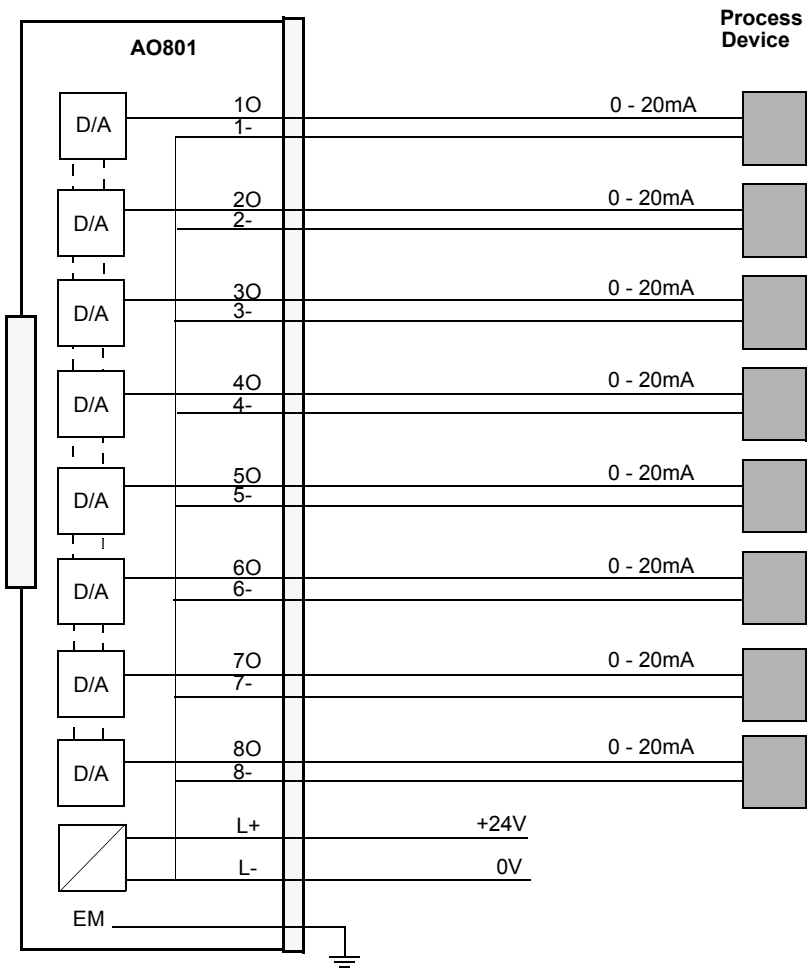


Figure 69. AO801 Process Connections

## AO810/AO810V2 Analog Output Module, 0(4)...20 mA

### Features

- 8 channels of 0...20 mA, 4...20 mA outputs.
- OSP sets outputs to predetermined state upon error detection.
- Analog Output is to be short circuit secured to ZP or +24 V.

### Description

The AO810/AO810V2 Analog Output Module has 8 unipolar analog output channels.

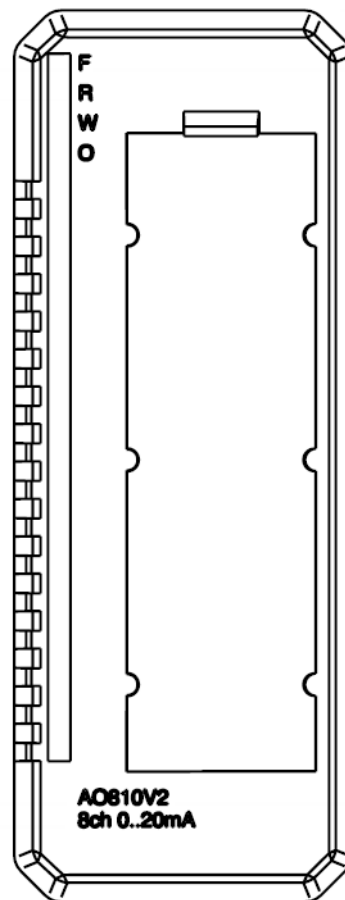
To supervise the communication to the D/A-converters the serial data is read back and verified. The open-circuit diagnostic is received during the readback.

The module performs self-diagnostic cyclically.

The module diagnostics includes process power supply supervision, which is reported when supply voltage to output circuitry is to low. The error is reported as a channel error.

The channel diagnostic includes fault detection of the channel (only reported on active channels). The error is reported if the output current is less than the output set value and the output set value is greater than 1 mA.

Four different types of MTUs can be used. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU enables wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.



**Technical Data***Table 35. AO810/AO810V2 Analog Output Module Specifications at 25°C*

<b>Feature</b>	<b>AO810/AO810V2 Analog Output Module</b>
Number of channels	8
Output range	0... 20 mA, 4...20 mA <sup>(1)</sup>
Over range	15%
Output load	≤500 ohms <sup>(2)</sup> , 250 - 850 ohms <sup>(3)</sup>
Maximum field cable length	600 meters (656 yd.)
Rise time	0 - 90% 0.35 ms RL = 500 ohms
Cycle time	≤2 ms
Error	Max. 0.1% at 0 - 500 ohms
Resolution	14 bit
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Typ. 30 ppm/°C Max. 60 ppm/°C
Current consumption 24 V (process power supply, UPx)	AO810: 200 mA (max) AO810V2: 245 mA <sup>(4)</sup> (max 20mA on 8 channels)
Supervision	Module: Output power low Channel: Open-circuit (for current > 1 mA)
Current consumption 5 V (Modulebus)	70 mA (max)
Power dissipation <sup>(5)</sup>	2.3 W
Isolation	Groupwise isolated from ground
Mounting termination units	TU810, TU812, TU814 and TU830

Table 35. AO810/AO810V2 Analog Output Module Specifications at 25°C (Continued)

Feature	AO810/AO810V2 Analog Output Module
MTU keying code	AE
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Handled by the FCI or controller.

(2) With supply connected to L1+ only

(3) With supply connected to L2+ only.

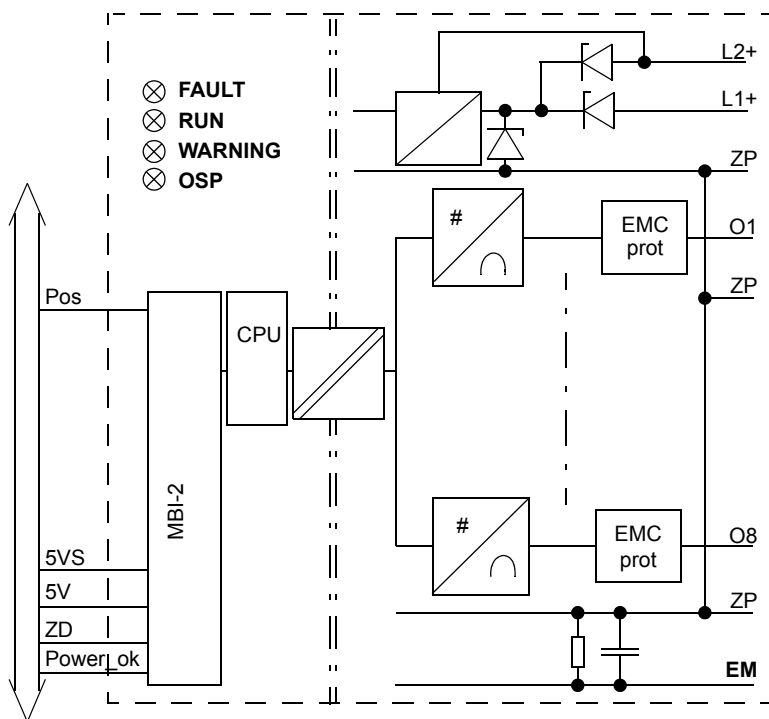
**Note:**  $R_L = 250 \dots 850$  ohms (with power supply connected to L2+), for AO810V2 850 ohms even at 19.2 V

Power supply min. =  $U_{drop} + I_{max.} \times R_L = 7.7 \text{ V} + 0.023 \times R_L (\geq 19.2 \text{ V})$

Power Supply max. = 30 V

(4) AO810V2 replaces AO810

(5) 250 ohm load, 70% of nominal current, all channels activated. Supply L+ connected.

**Block Diagram AO810/AO810V2***Figure 70. AO810/AO810V2 Block Diagram*



**Process Connections***Table 36. AO810 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 DSub 25 male connector <sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)
-	-	-	B1, B2
Ch1, + Output	C1	3	C1
Ch1 Return (ZP)	A1	-	A1, A2
-	-	-	B3, B4
Ch 2, + Output	C2	4	C3
Ch2 Return (ZP)	A2	-	A3, A4
-	-	-	B5, B6
Ch 3, + Output	C3	5	C5
Ch3 Return (ZP)	A3	-	A5, A6
-	-	-	B7, B8
Ch 4, + Output	C4	6	C7
Ch4 Return (ZP)	A4	-	A7, A8
-	-	-	B9, B10
Ch 5, + Output	C5	7	C9
Ch5 Return (ZP)	A5	-	A9, A10
-	-	-	B11, B12
Ch 6, + Output	C6	8	C11
Ch6 Return (ZP)	A6	-	A11, A12

Table 36. AO810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 DSub 25 male connector <sup>(1)</sup>	TU830/TU833 Terminal
-	-	-	B13, B14
Ch 7, + Output	C7	9	C13
Ch7 Return (ZP)	A7	-	A13, A14
-	-	-	B15, B16
Ch 8, + Output	C8	10	C15
Ch8 Return (ZP)	A8	-	A15, A16
+24 V dc	L2+ (2)	11, 24	L2+ (2)
0 V dc (ZP)	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 71 shows the process connections for the Analog Output Module AO810/AO810V2 when installed on a TU830 Extended MTU.

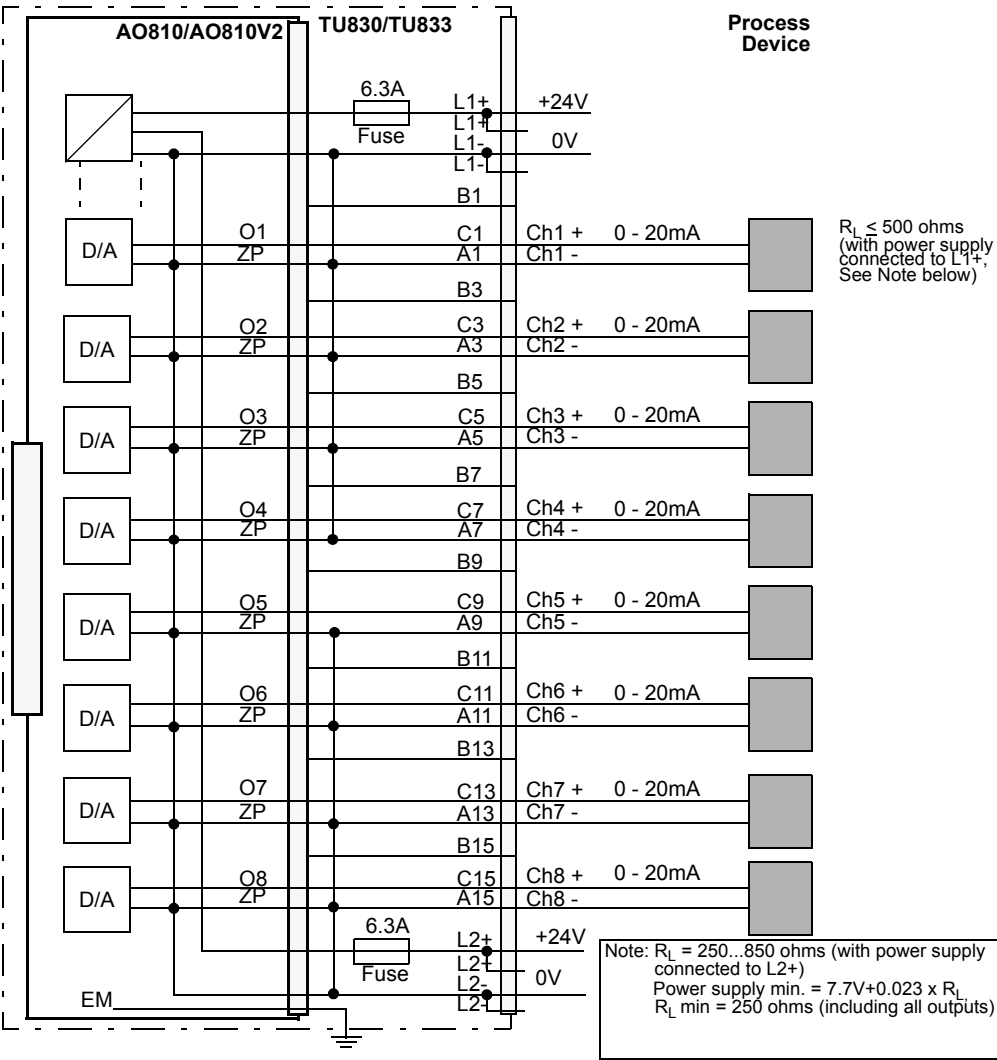


Figure 71. AO810/AO810V2 with TU830 Extended MTU Process Connections

Figure 72 shows the process connections for the AO810/AO810V2 when installed on a TU810 or TU814 Compact MTU.

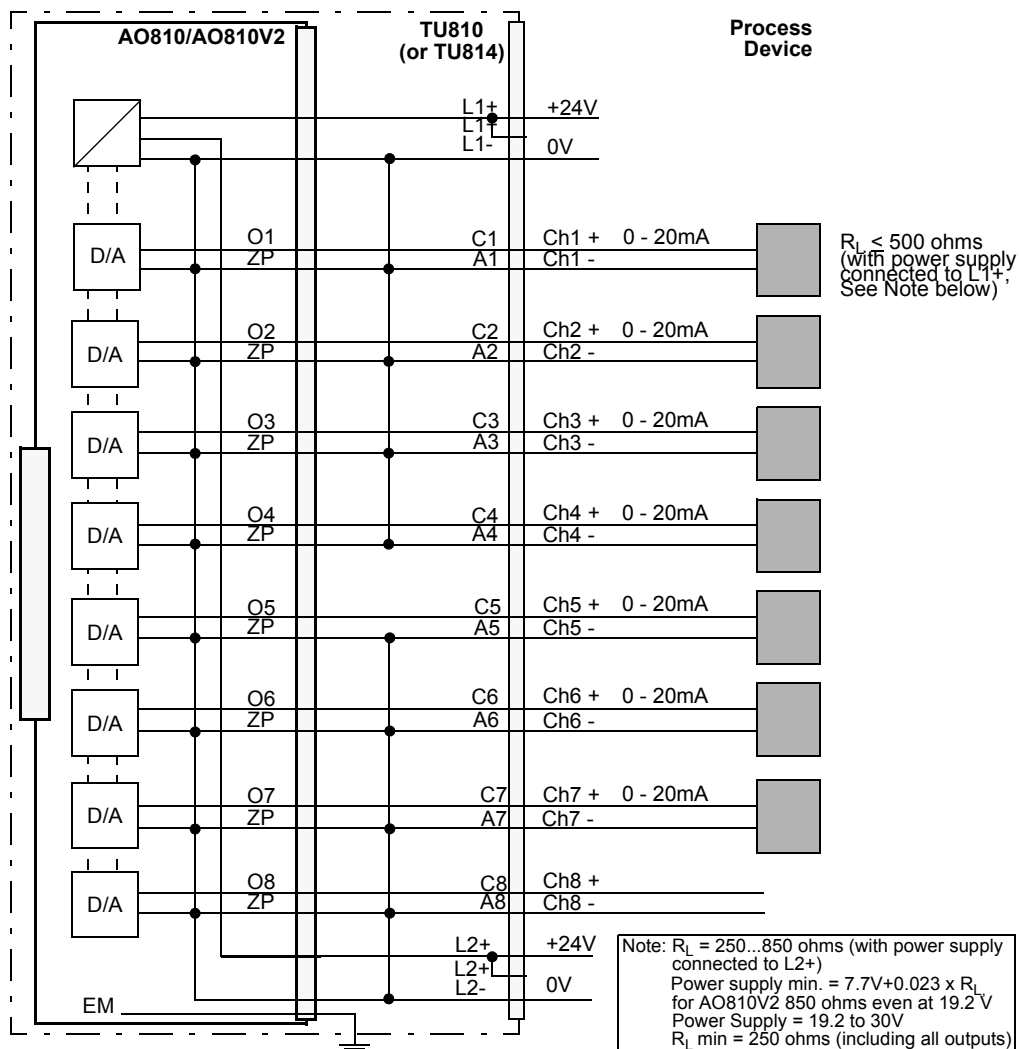


Figure 72. AO810/AO810V2 with TU810 or TU814 Compact MTU Process Connections

Figure 73 shows the process connections for the Analog Output Module AO810/AO810V2 when installed on a TU812 Compact MTU.

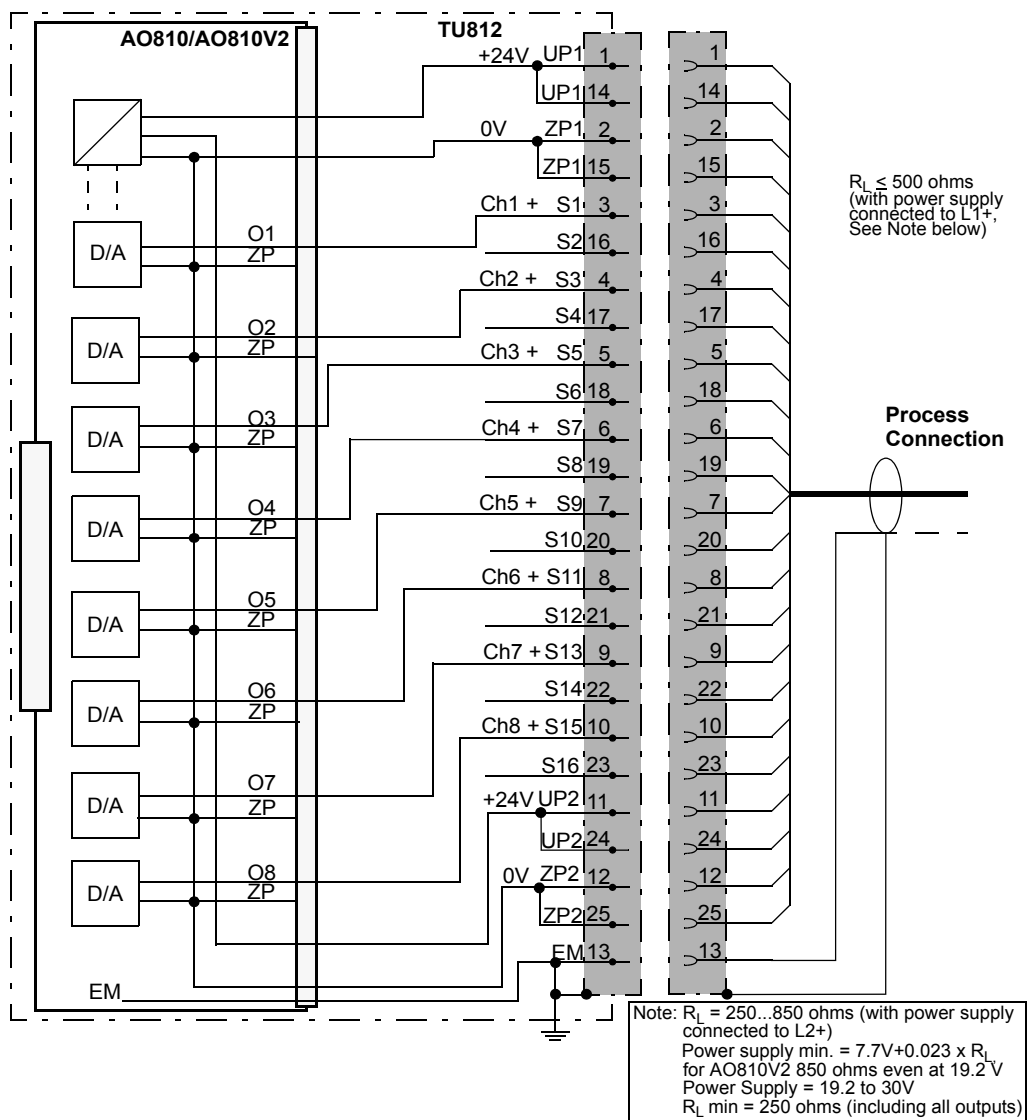


Figure 73. AO810/AO810V2 with TU812 Compact MTU Process Connections

## AO815 Analog Output Module

### Features

- 8 channels of 4...20 mA outputs.
- OSP sets outputs to predetermined state upon error detection.
- 1 group of 8 channels isolated from ground.
- Analog Output is to be short circuit secured to ZP or +24 V.
- 12 bit resolution.
- HART pass-through communication.

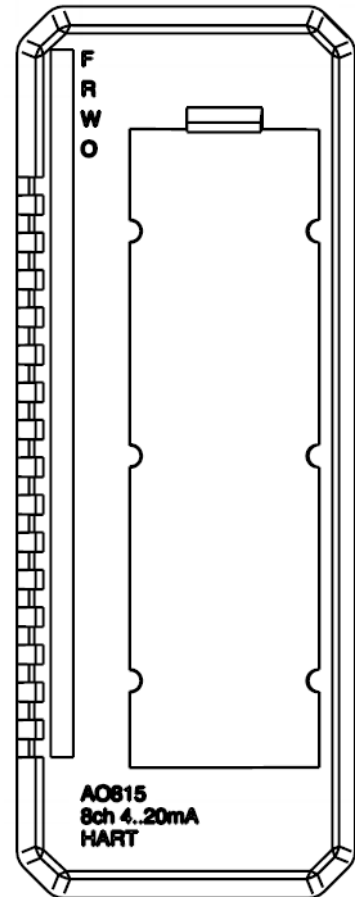
### Description

The AO815 Analog Output Module has 8 unipolar analog output channels.

The module performs self-diagnostic cyclically. Module diagnostics include:

- External Channel Error is reported (only reported on active channels) if the process power supply that supply voltage to output circuitry is too low, or the output current is less than the output set value and the output set value is greater than 1 mA (open circuit).
- Internal Channel Error is reported if the output circuit can not give the right current value.
- Module Error is reported in case of Output Transistor Error, Short Circuit, Checksum Error, Internal Power Supply Error or Watchdog error.

The module has HART pass-through functionality. Only point to point communication is supported. The output filter must be enabled on channels used for HART communication.



Four different types of MTUs can be used. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU enables wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

Shielded field cables for process connections are required if HART is used.

### Technical Data

*Table 37. AO815 Analog Output Module Specifications at 25°C*

Feature	AO815 Analog Output Module
Number of channels	8
Output range	4...20 mA
Over range	±15%
Output load	Max 750 ohms
Maximum field cable length	600 meters (656 yd.)
Rise time output filter - disable - enable	23 ms (0-90%) max 4 mA / 12.5 ms
Cycle time	10 ms
Error	Max. 0.1%
Resolution	12 bit
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Max. 50 ppm/°C
Current consumption 24 V (process power supply, UPx)	165 mA (max)
Current consumption 5 V (Modulebus)	125 mA (max)
Power dissipation <sup>(1)</sup>	3.5 W

Table 37. AO815 Analog Output Module Specifications at 25°C (Continued)

Feature	AO815 Analog Output Module
Isolation	Groupwise isolated from ground
Mounting termination units	TU810, TU812, TU814, TU830 and TU833
MTU keying code	DB
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) 250 ohm load, 70% of nominal current, all channels activated.



### Block Diagram AO815

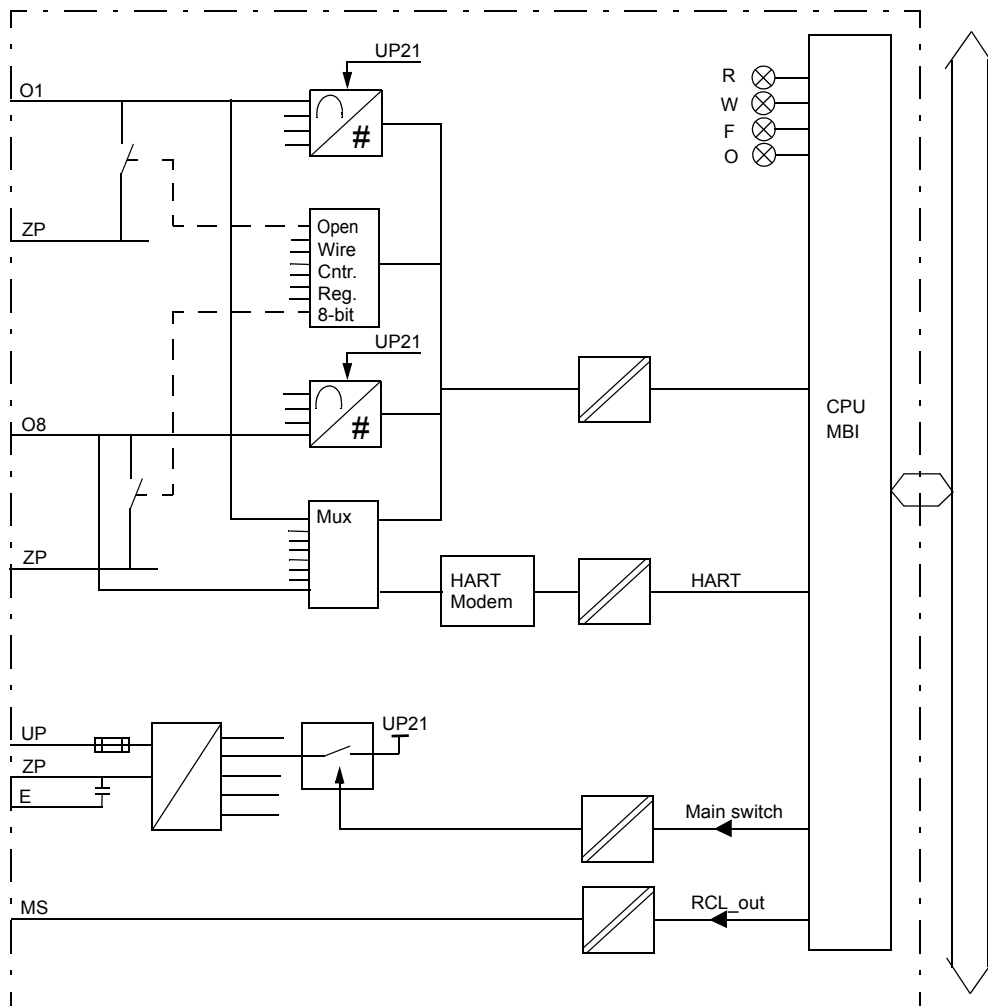


Figure 74. AO815 Block Diagram

### Process Connections

With HART signals shielded cables should be used for current process connections.

*Table 38. AO815 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 DSub 25 male connector <sup>(1)</sup>	TU830/TU833 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)
-	-	-	B1, B2
Ch1, + Output	C1	3	C1
Ch1 Return (ZP)	A1	-	A1, A2
-	-	-	B3, B4
Ch 2, + Output	C2	4	C3
Ch2 Return (ZP)	A2	-	A3, A4
-	-	-	B5, B6
Ch 3, + Output	C3	5	C5
Ch3 Return (ZP)	A3	-	A5, A6
-	-	-	B7, B8
Ch 4, + Output	C4	6	C7
Ch4 Return (ZP)	A4	-	A7, A8
-	-	-	B9, B10
Ch 5, + Output	C5	7	C9
Ch5 Return (ZP)	A5	-	A9, A10
-	-	-	B11, B12
Ch 6, + Output	C6	8	C11

Table 38. AO815 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 DSub 25 male connector <sup>(1)</sup>	TU830/TU833 Terminal
Ch6 Return (ZP)	A6	-	A11, A12
-	-	-	B13, B14
Ch 7, + Output	C7	9	C13
Ch7 Return (ZP)	A7	-	A13, A14
-	-	-	B15, B16
Ch 8, + Output	C8	10	C15
Ch8 Return (ZP)	A8	-	A15, A16
0 V dc (ZP)	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 75 shows the process connections for the AO815 when installed on a TU830/TU833 Extended MTU.

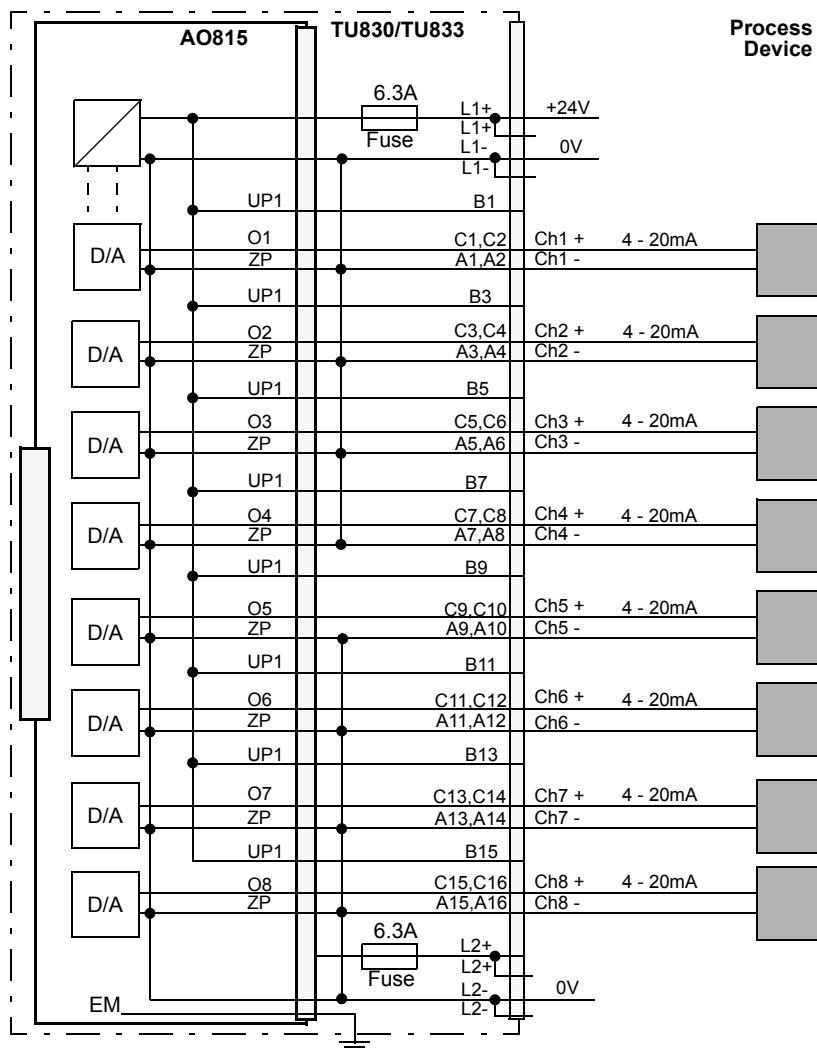


Figure 75. AO815 with TU830/TU833 Extended MTU Process Connections

Figure 76 shows the process connections for the AO815 when installed on a TU810 or TU814 Compact MTU.

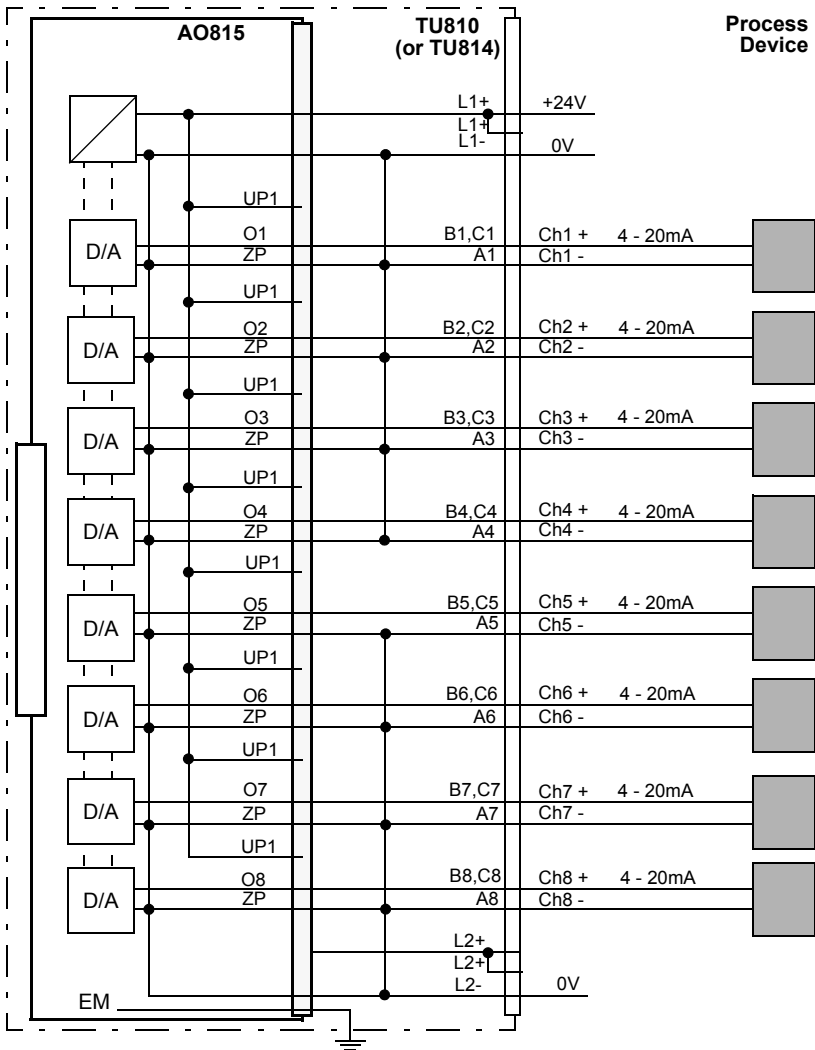


Figure 76. AO815 with TU810 or TU814 Compact MTU Process Connections

Figure 77 shows the process connections for the AO815 when installed on a TU812 Compact MTU.

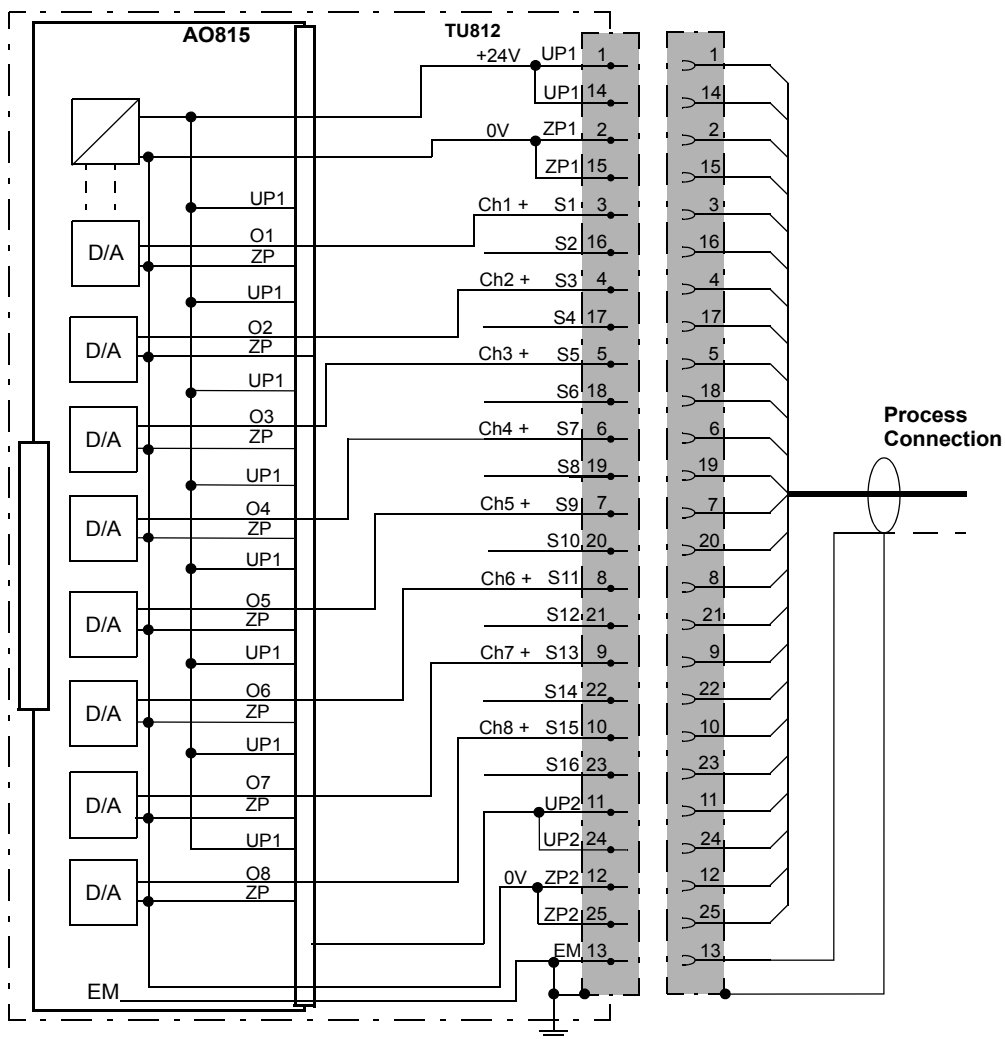


Figure 77. AO815 with TU812 Compact MTU Process Connections

## AO820 Galvanically Isolated Bipolar Analog Output Module

### Features

- 4 channels of  $-20\text{ mA} \dots +20\text{ mA}$ ,  $0 \dots 20\text{ mA}$ ,  $4 \dots 20\text{ mA}$  or  $-10\text{ V} \dots +10\text{ V}$ ,  $0 \dots 10\text{ V}$ ,  $2 \dots 10\text{ V}$  outputs.
- Individually galvanically isolated channels.
- OSP sets outputs to predetermined state upon error detection.

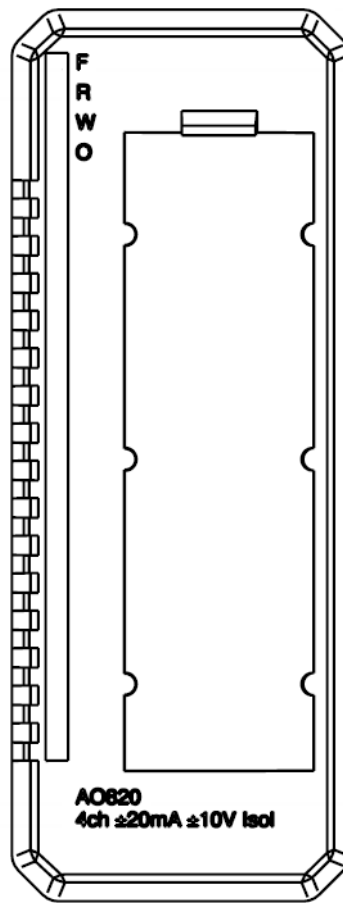
### Description

The AO820 Analog Output Module has 4 bipolar analog output channels. The choice of current or voltage output is configurable for each channel. There are separate sets of terminals for voltage and current outputs, and it is up to the user to wire outputs properly. The only differences between current or voltage channel configuration is in software settings.

To supervise the communication to the A/D-converters the output data is read back and verified. The open-circuit diagnostics are read continuously as well.

The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus.

The Channel diagnostics include fault detection of the channel (only reported on active channels). The error is reported if the output current differ from the output set value (that is, open wire condition).



Four different types of MTUs can be used. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU enables wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

### Technical Data

*Table 39. AO820 Analog Output Module Specifications at 25°C*

Feature	AO820 Analog Output Module
Number of channels	4
Output ranges (nominal)	-20 mA...+20 mA, 0...20 mA, 4...20 mA ( <sup>1</sup> ) or -10 V...+10 V, 0...10 V, 2...10 V( <sup>1</sup> )
Over range	± 15%
Output load	≤ 550 ohms - Nominal ranges ≤ 510 ohms - Over-range
Output load, voltage outputs	≥ 5k ohms
Maximum field cable length	600 meters (656 yd.)
Rise time	< 0.7 ms
Cycle time for all channels	≤ 1.5 ms
Error, Voltage	Max. 0.1%
Error, Current	at 250 ohms typ. 0.1%, max. 0.15%
Resolution	12 bits plus sign
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Max. 90 ppm/°C
Current consumption 24 V (Modulebus)	260 mA (max)
Current consumption 5 V (Modulebus)	100 mA (max)



*Table 39. AO820 Analog Output Module Specifications at 25°C (Continued)*

Feature	AO820 Analog Output Module
Power dissipation <sup>(2)</sup>	6 W
Supervision	Module: Output power low Channel: Open circuit (for current > 1mA)
Isolation	Individually isolated, channel-to-channel and to circuit common
Module termination units	TU810, TU812, TU814 or TU830
MTU keying code	BC
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Handled by the controller or FCI.

(2) Power dissipation is calculated with 250 ohms load, 70 percent of nominal output current, all channels activated.

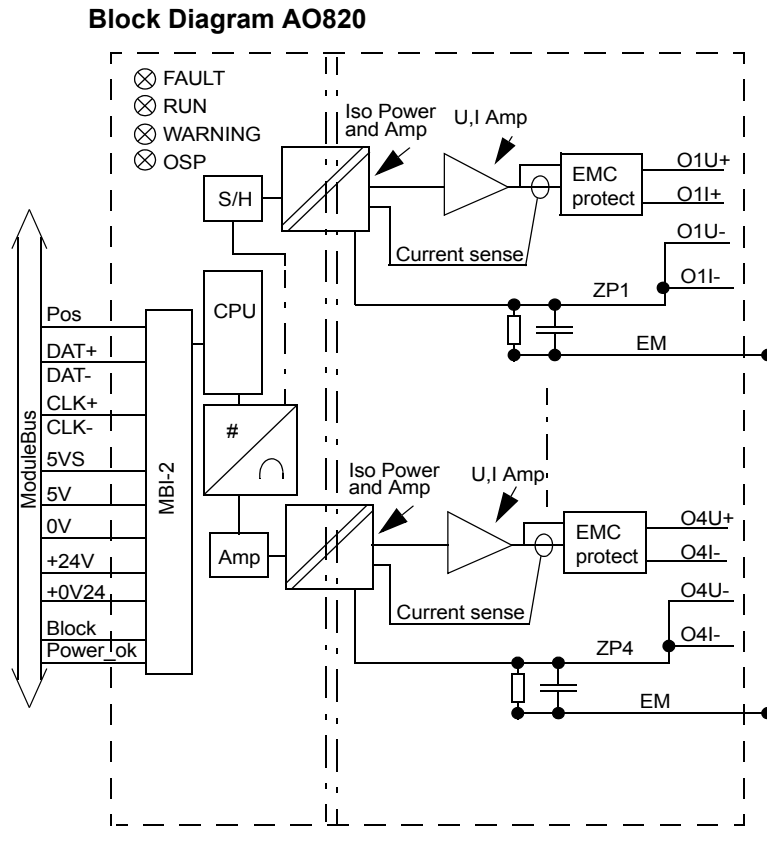


Figure 78. AO820 Block Diagram

**Process Connections***Table 40. AO820 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector <sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>
Not used	L1+ (2)	1, 14	L1+ (2)
Not used	L1-	2, 15	L1- (2)
-	-	-	B1, B2
Ch1, Current Output +	C1	3	C1
Ch1, Current Output -	B1	16	C2
-	A1	-	A1, A2
-	-	-	B3, B4
Ch1, Voltage Output +	C2	4	C3
Ch1, Voltage Output -	B2	17	C4
-	A2	-	A3, A4
-	-	-	B5, B6
Ch2, Current Output +	C3	5	C5
Ch2, Current Output -	B3	18	C6
-	A3	-	A5, A6
-	-	-	B7, B8
Ch2, Voltage Output +	C4	6	C7
Ch2, Voltage Output -	B4	19	C8
-	A4	-	A7, A8
-	-	-	B9, B10
Ch3, Current Output +	C5	7	C9

Table 40. A0820 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal
Ch3, Current Output -	B5	20	C10
-	A5	-	A9, A10
-	-	-	B11, B12
Ch3, Voltage Output +	C6	8	C11
Ch3, Voltage Output -	B6	21	C12
-	A6	-	A11, A12
-	-	-	B13, B14
Ch4, Current Output +	C7	9	C13
Ch4, Current Output -	B7	22	C14
-	A7	-	A13, A14
-	-	-	B15, B16
Ch4, Voltage Output +	C8	10	C15
Ch4, Voltage Output -	B8	23	C16
-	A8	-	A15, A16
Not used	L2+ (2)	11, 24	L2+ (2)
Not used	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 79 shows the process connections for the Bipolar Analog Output Module AO820 when installed on a TU830 Extended MTU.

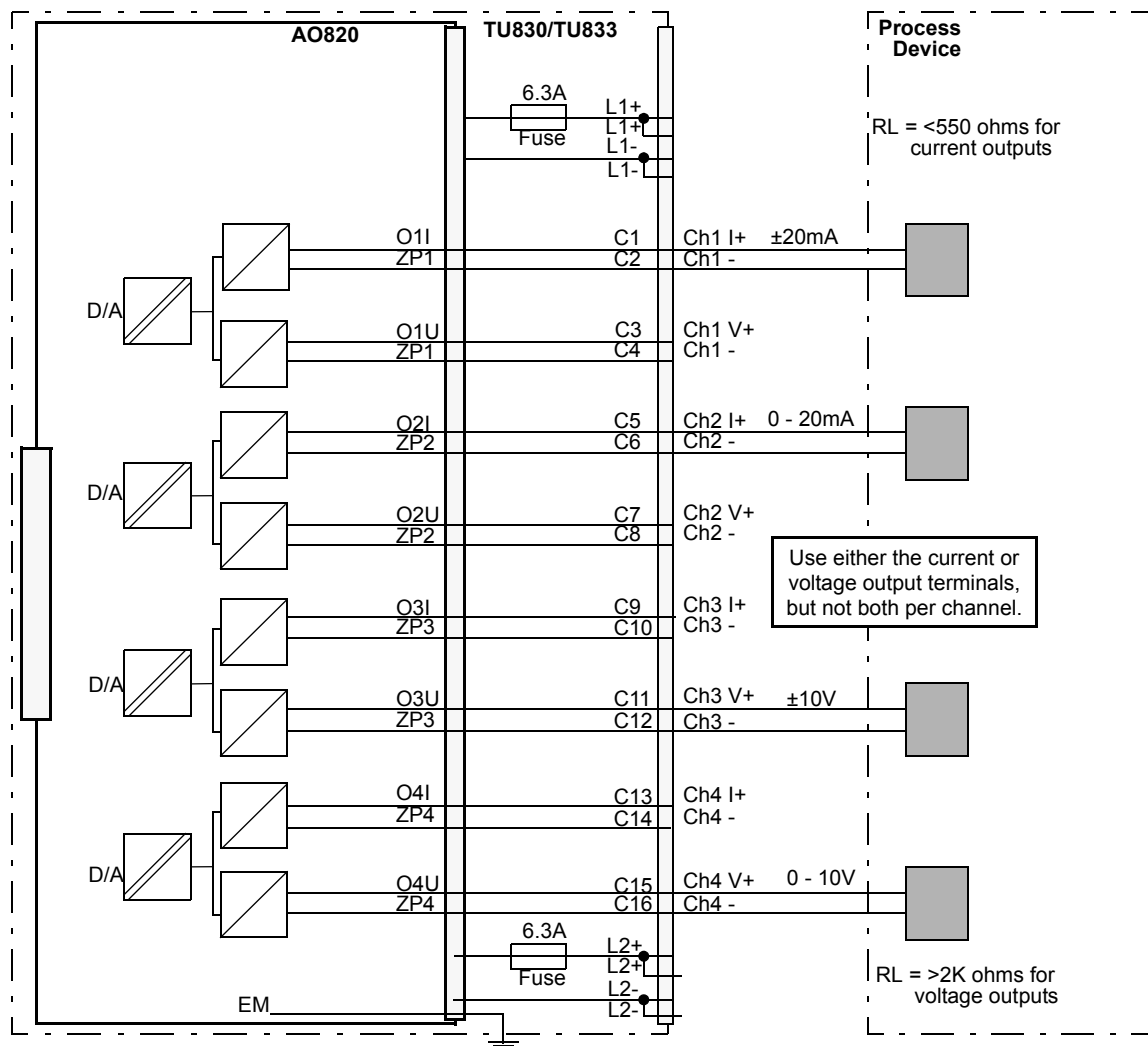


Figure 79. AO820 with TU830 Extended MTU Process Connections

Figure 80 shows the process connections for the AO820 when installed on a TU810 or TU814 Compact MTU.

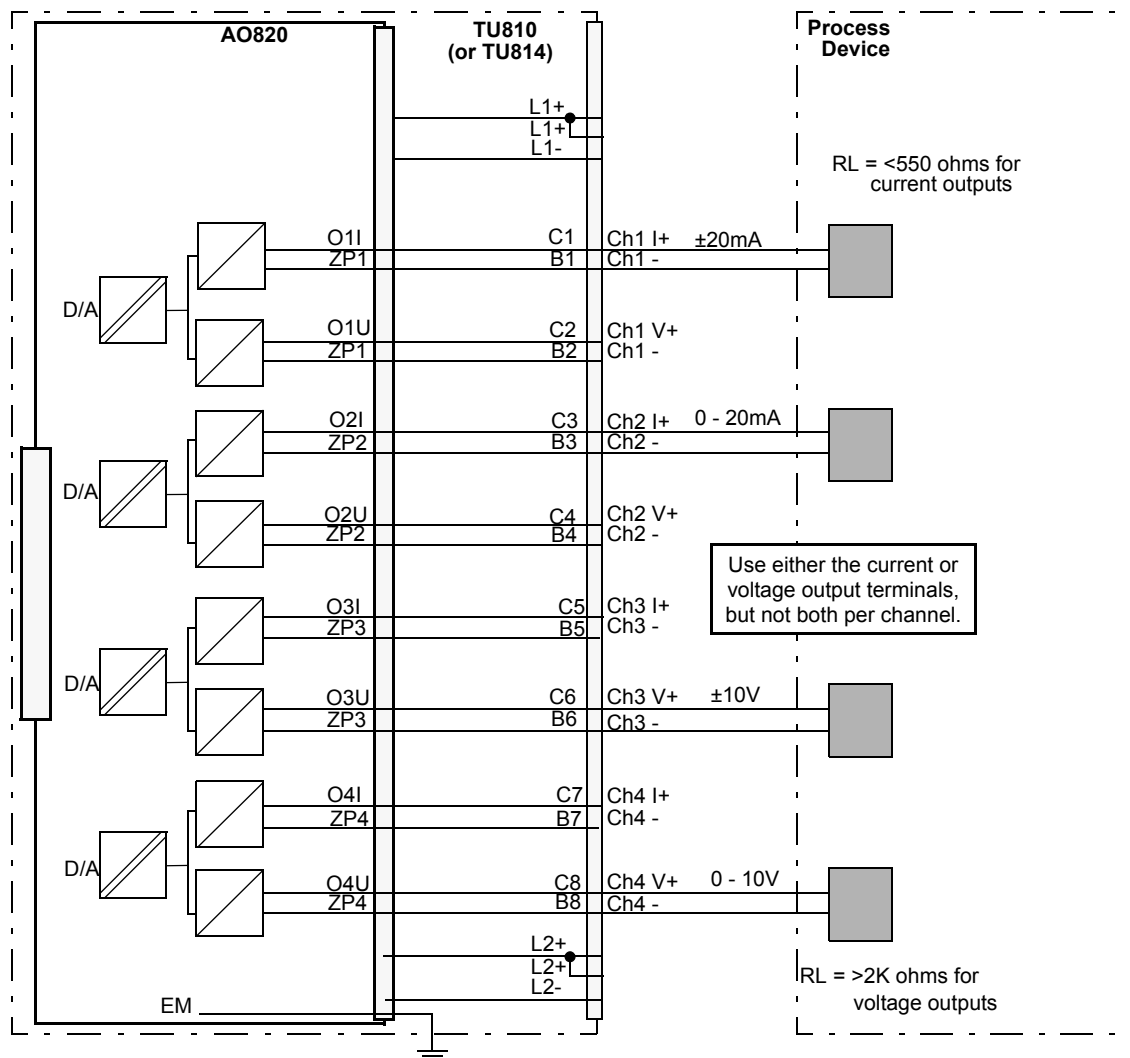


Figure 80. AO820 with TU810 or TU814 Compact MTU Process Connections

**Figure 81** shows the process connections for the AO820 when installed on a TU812 Compact MTU

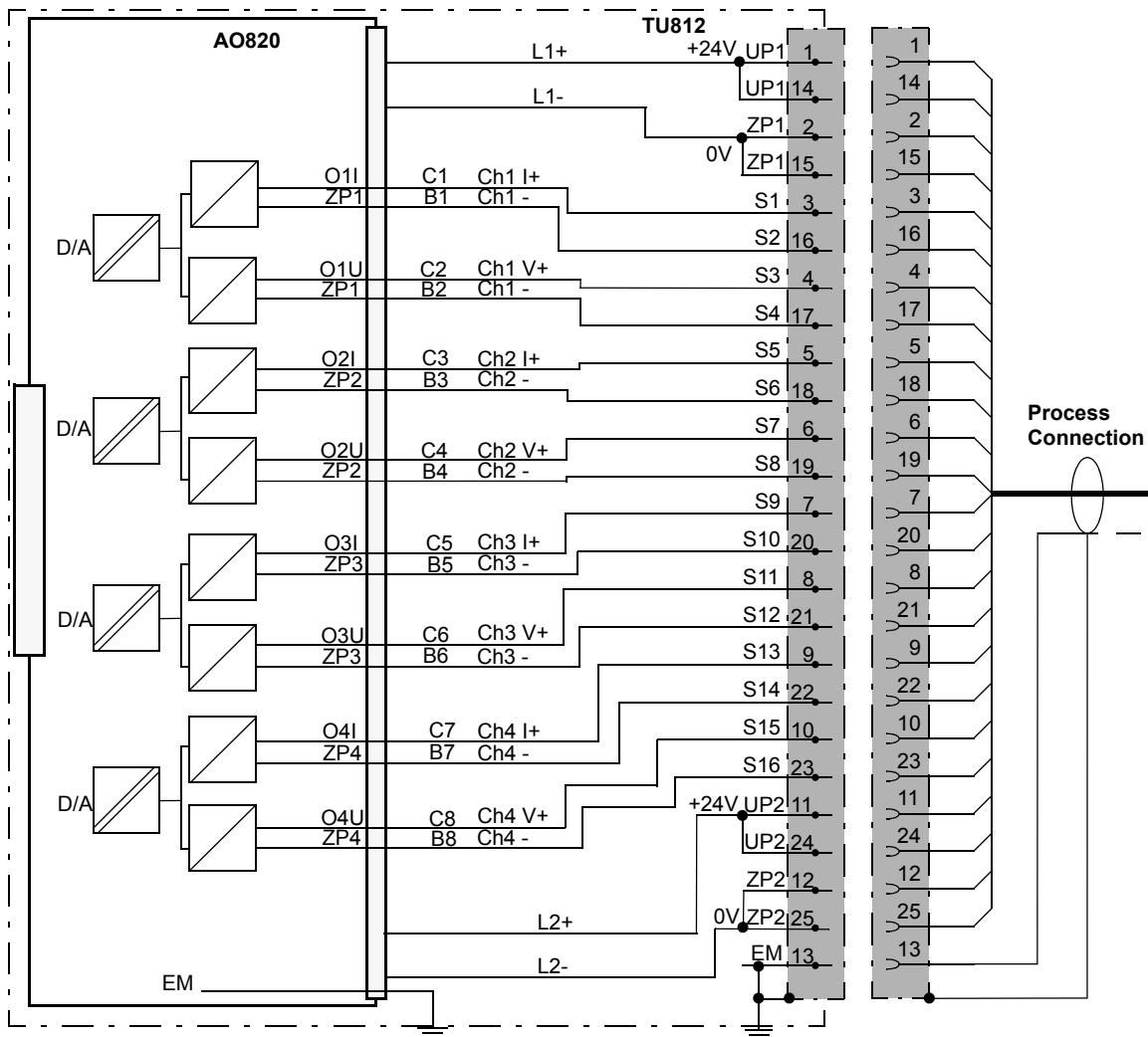


Figure 81. AO820 with TU812 Compact MTU

## AO845/AO845A Analog Output Module, Single or Redundant

### Features

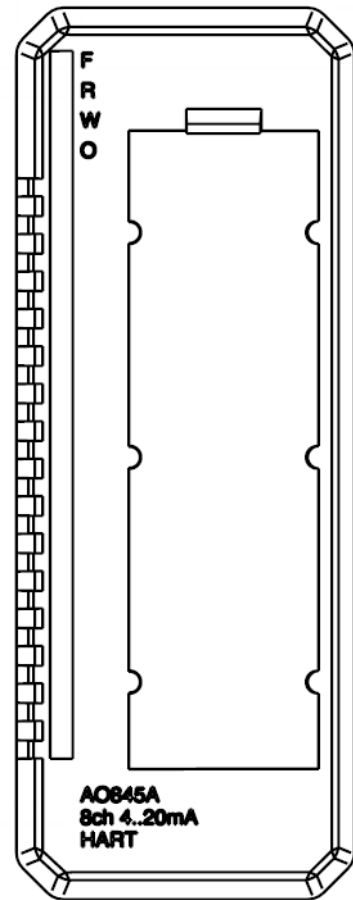
- 8 channels of 4...20 mA outputs.
- For single or redundant applications.
- OSP sets outputs to predetermined state upon error detection.
- 1 group of 8 channels isolated from ground.
- Analog Output is to be short circuit secured to ZP or +24 V.
- Advanced on-board diagnostics.
- 12 bit resolution.
- HART pass-through communication.

### Description

The AO845/AO845A Analog Output Module for single or redundant applications has 8 unipolar analog output channels.

The module performs self-diagnostic cyclically. Module diagnostics include:

- External Channel Error is reported (only reported on active channels) if the process power supply that supply voltage to output circuitry is too low, or the output current is less than the output set value and the output set value > 1 mA (open circuit).
- Internal Channel Error is reported if the output circuit can not give the right current value. In a redundant pair the module will be commanded to error state by the ModuleBus master.





- Module Error is reported in case of Output Transistor Error, Short Circuit, Checksum Error, Internal Power Supply Error, Status Link Error, Watchdog or Wrong OSP behavior.

The module has HART pass-through functionality. Only point to point communication is supported. The output filter must be enabled on channels used for HART communication.

Five different types of MTUs can be used for single applications. The TU830/TU833 Extended MTU and the TU810 (or TU814) Compact MTU enables wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant applications there are three types of MTUs, TU842/TU852 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

Shielded field cables for process connections are required if HART is used.

### Technical Data

*Table 41. AO845/AO845A Analog Output Module Specifications at 25°C*

Feature	AO845/AO845A Analog Output Module
Number of channels	8
Output range	4...20 mA
Over range	±15%
Output load	Max 750 ohms
Maximum field cable length	600 meters (656 yd.)
Rise time output filter - disable - enable	23 ms (0-90%) max 4 mA / 12.5 ms
Cycle time	10 ms
Error	Max. 0.1%
Resolution	12 bit

Table 41. AO845/AO845A Analog Output Module Specifications at 25°C (Continued)

Feature	AO845/AO845A Analog Output Module
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Max. 50 ppm/°C
Current consumption 24 V (process power supply, UPx)	218 mA (max 20mA on 8 channels)
Current consumption 5 V (Modulebus)	125 mA (max)
Power dissipation <sup>(1)</sup>	3.5 W
Isolation	Groupwise isolated from ground
Mounting termination units	TU810, TU812, TU814, TU830, TU833, TU842, TU843 and TU852
MTU keying code	AO845: CC AO845A: DB
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) 250 ohm load, 70% of nominal current, all channels activated.

### Block Diagram AO845/AO845A

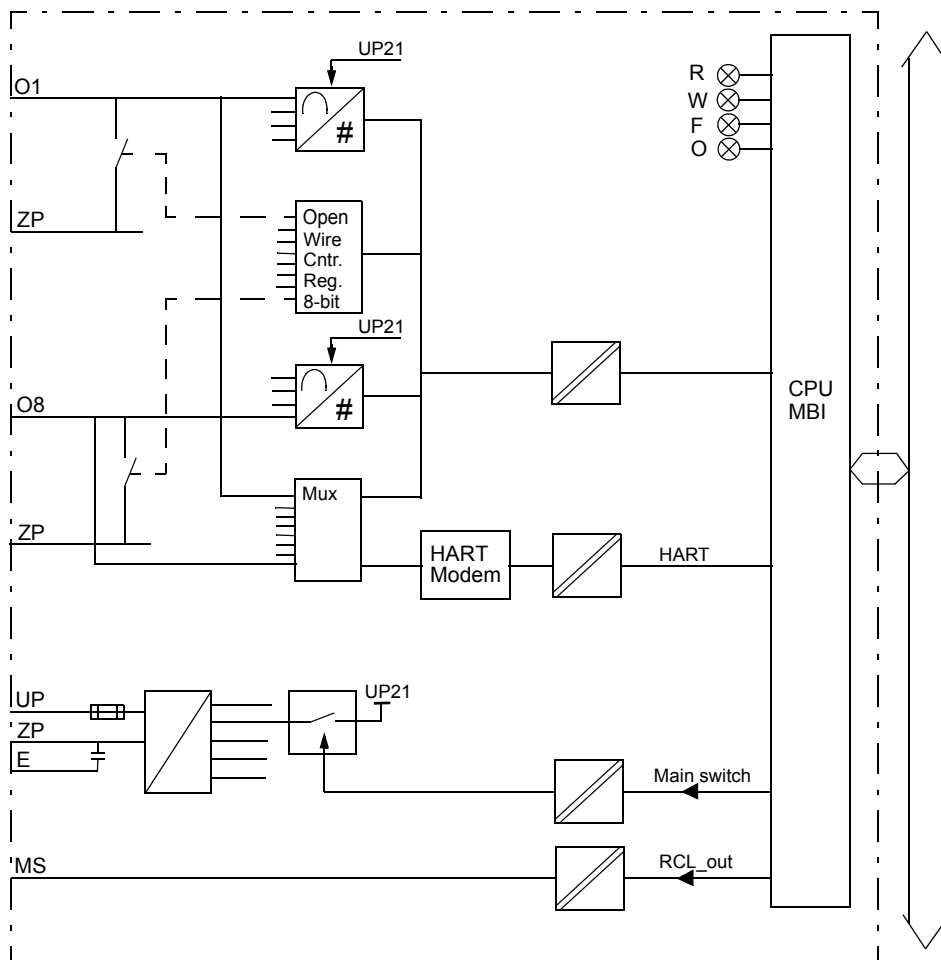


Figure 82. AO845/AO845A Block Diagram

**Process Connections**

With HART signals shielded cables should be used for current process connections.

*Table 42. AO845/AO845A Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 DSUB 25 male connector<sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>	<b>TU842/TU843 Terminal</b>	<b>TU852 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	1, 14 (X1a)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)	L1- (2)	2, 15 (X1a)
-	-	-	B1, B2	B1, B2	-
Ch1, + Output	C1	3	C1	C1	3 (X1a)
Ch1 Return (ZP)	A1	-	A1, A2	A1, A2	-
-	-	-	B3, B4	B3, B4	-
Ch 2, + Output	C2	4	C3	C3	4 (X1a)
Ch2 Return (ZP)	A2	-	A3, A4	A3, A4	-
-	-	-	B5, B6	B5, B6	-
Ch 3, + Output	C3	5	C5	C5	5 (X1a)
Ch3 Return (ZP)	A3	-	A5, A6	A5, A6	-
-	-	-	B7, B8	B7, B8	-
Ch 4, + Output	C4	6	C7	C7	6 (X1a)
Ch4 Return (ZP)	A4	-	A7, A8	A7, A8	-
-	-	-	B9, B10	B9, B10	-
Ch 5, + Output	C5	7	C9	C9	7 (X1a)
Ch5 Return (ZP)	A5	-	A9, A10	A9, A10	-
-	-	-	B11, B12	B11, B12	-
Ch 6, + Output	C6	8	C11	C11	8 (X1a)

Table 42. AO845/AO845A Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 DSUB 25 male connector <sup>(1)</sup>	TU830/TU833 Terminal	TU842/TU843 Terminal	TU852 Terminal
Ch6 Return (ZP)	A6	-	A11, A12	A11, A12	-
-	-	-	B13, B14	B13, B14	-
Ch 7, + Output	C7	9	C13	C13	9 (X1a)
Ch7 Return (ZP)	A7	-	A13, A14	A13, A14	-
-	-	-	B15, B16	B15, B16	-
Ch 8, + Output	C8	10	C15	C15	10 (X1a)
Ch8 Return (ZP)	A8	-	A15, A16	A15, A16	-
0 V dc (ZP)	L2-	12, 25	L2- (2)	L2- (2)	12, 25 (X1a)

(1) Pin 13 connected to connector body for EM.

Figure 83 shows the process connections for the AO845/AO845A when installed on a TU830 Extended MTU.

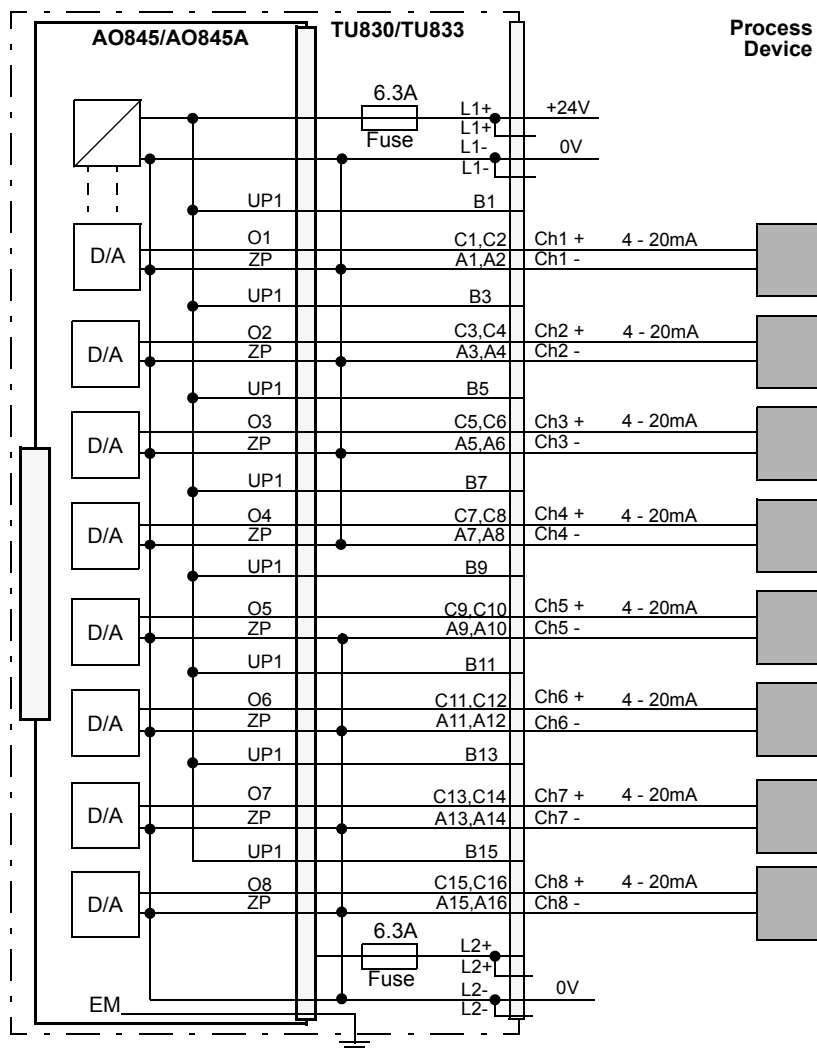


Figure 83. AO845/AO845A with TU830 Extended MTU Process Connections

Figure 84 shows the process connections for the AO845/AO845A when installed on a TU810 or TU814 Compact MTU.

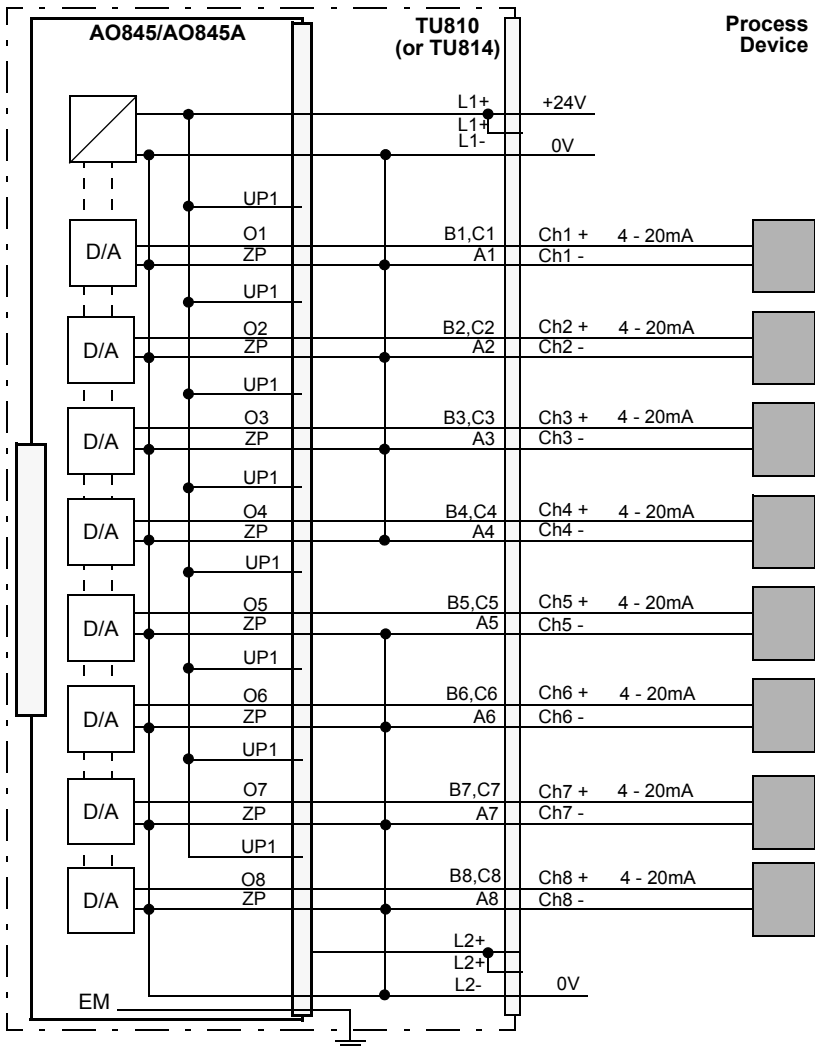


Figure 84. AO845/AO845A with TU810 or TU814 Compact MTU Process Connections

Figure 85 shows the process connections for the AO845/AO845A when installed on a TU812 Compact MTU.

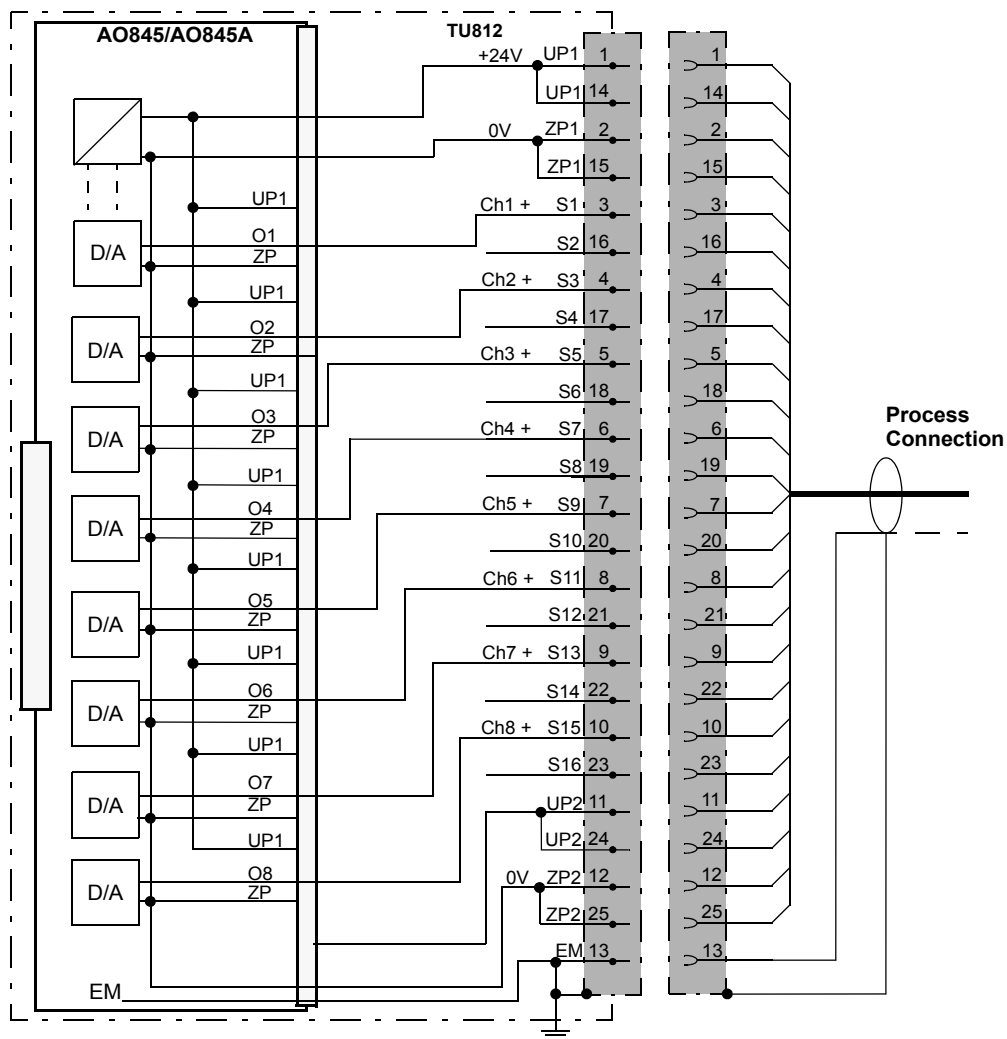


Figure 85. AO845/AO845A with TU812 Compact MTU Process Connections



Figure 86 shows the process connections for the AO845/AO845A when installed on a TU842 or TU843 Redundant MTU.

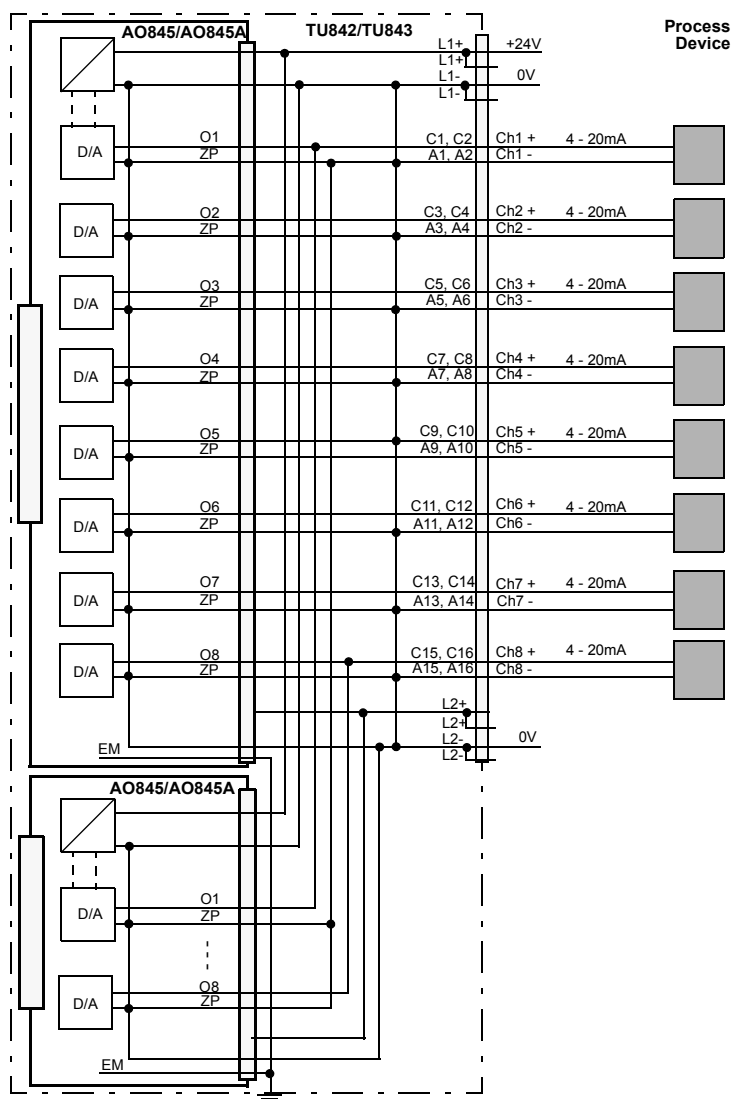


Figure 86. AO845/AO845A with TU842 or TU843 Redundant MTU Process Connections

Figure 87 shows the process connections for the AO845A when installed on a TU852 Redundant MTU.

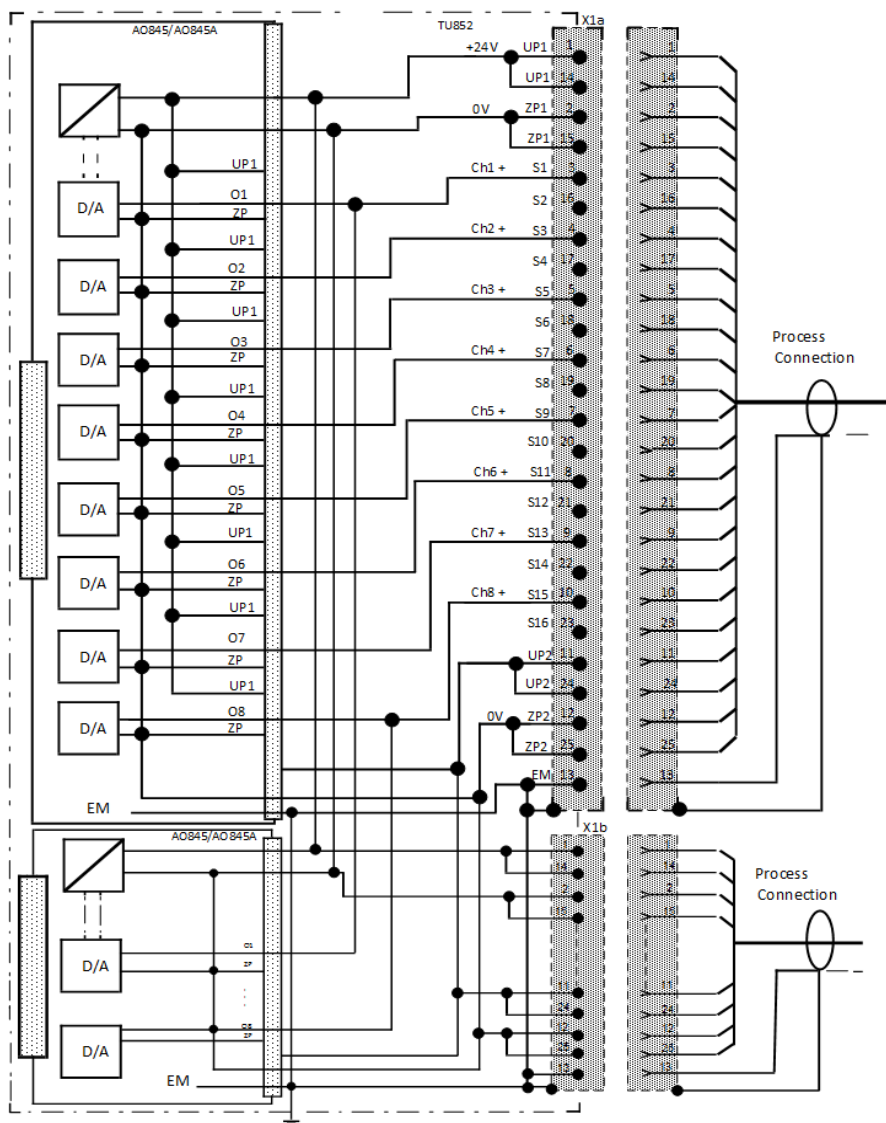


Figure 87. AO845A with TU852 Redundant Horizontal Dual MTU Process Connections

## DI801 Digital Input Module, 24 V, Current Sinking

### Features

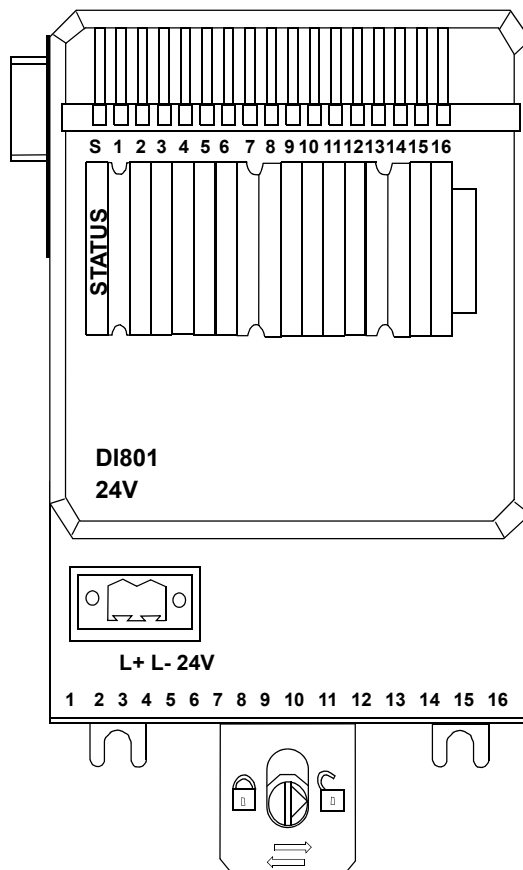
- 16 channels for 24 V d.c. inputs with current sinking.
- 1 isolated groups of 16 with voltage supervision.
- Input status indicators.
- Process and power connection via detachable connectors.

### Description

The DI801 is a 16 channel 24 V digital input module for the S800 I/O. This module has 16 digital inputs. The input voltage range is 18 to 30 volt d.c. and the input current is 6 mA at 24 V. The inputs are in one isolated group with sixteen channels and channel number sixteen can be used for voltage supervision input in the group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Channel 16 can be used as process voltage supervision input for channels 1-15. If process voltage supervision is enabled, channels 1-15 will indicate channel error unless a high level voltage is applied on channel 16. The detection time for this supervision is 70 ms. If process voltage supervision is disabled channel 16 can be used as a normal input channel.



The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

### Technical Data

Table 43. DI801 Digital Input Module Specifications

Feature	DI801 Digital Input Module
Number of channels	16 (1 x 16), current sinking
Rated voltage (process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	15 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	6.7 mA @ 24 V d.c.
Input Current, "1"	>3.0mA
Input Current, "0"	<1.0 mA
Input Impedance	3.5 k $\Omega$
Maximum field cable length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	channel 16
Current consumption, 5 V (Modulebus)	70 mA
Power dissipation <sup>(1)</sup>	2.2 W
Isolation	Groupwise isolated from ground
Rated insulation voltage	50 V

Table 43. DI801 Digital Input Module Specifications (Continued)

Feature	DI801 Digital Input Module
Dielectric test voltage	500 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm <sup>2</sup> , 30-12 AWG Stranded: 0.05-1.5mm <sup>2</sup> , 30-12 AWG Recommended torque: 0.5 - 0.6Nm Stripping length: 6-7.5 mm, 0.24-0.30 in

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volts.

Block Diagram DI801

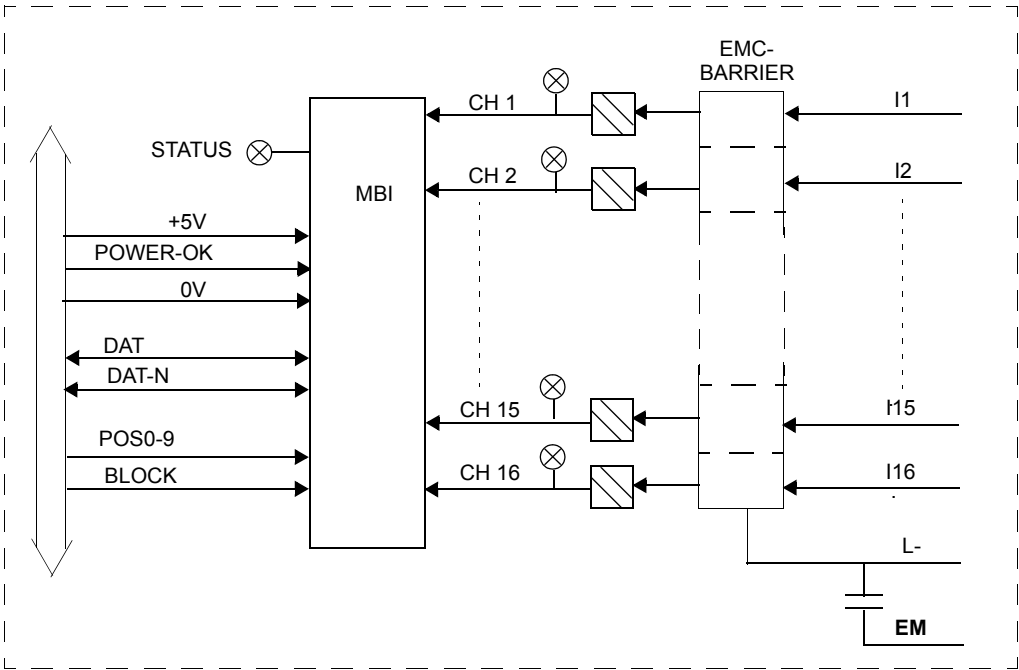


Figure 88. DI801 Block Diagram

**Process Connections**

*Table 44. DI801 Process Connections*

<b>Process Connection</b>	<b>Process Terminal</b>
Ch1 Input	1
Ch 2 Input	2
Ch 3 Input	3
Ch 4 Input	4
Ch 5 Input	5
Ch 6 Input	6
Ch 7 Input	7
Ch 8 Input	8
Ch 9 Input	9
Ch 10 Input	10
Ch 11 Input	11
Ch 12 Input	12
Ch 13 Input	13
Ch 14 Input	14
Ch 15 Input	15
Ch 16 Input	16

Figure 89 shows the process connections for the DI801.

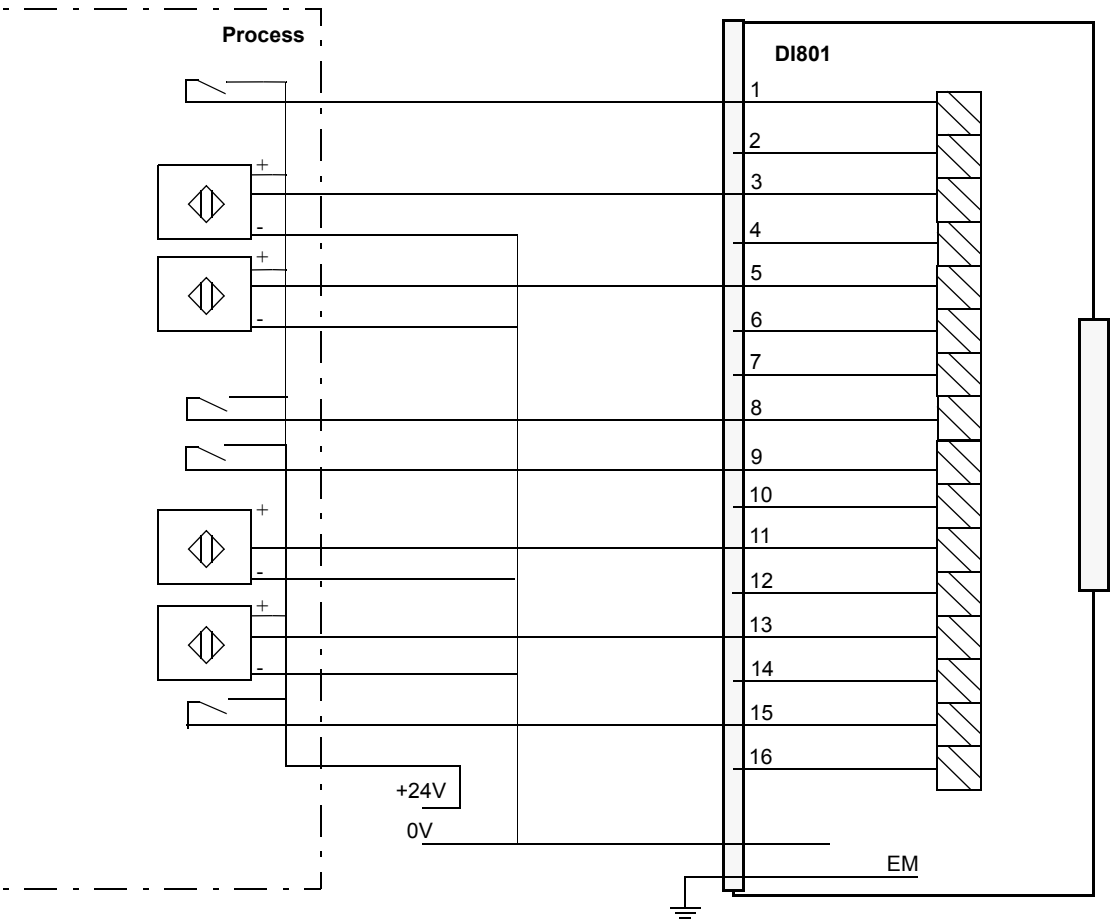


Figure 89. DI801 Process Connections

## DI802 Digital Input Module, 120 V a.c./d.c., Current Sinking

### Features

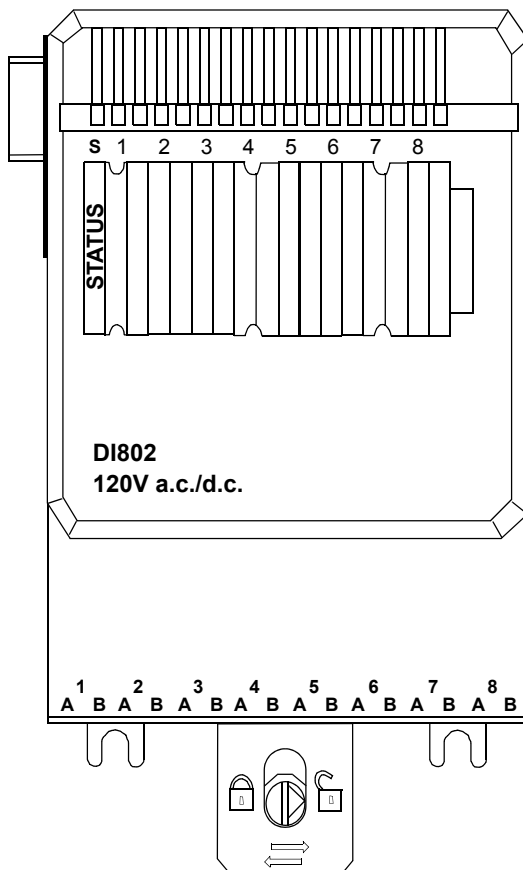
- 8 channels for 120 V a.c./d.c. inputs with current sinking.
- Individually isolated channels.
- Voltage supervision of field input power.
- Input status indicators.
- Signal filtering.
- Process connection via detachable connectors.

### Description

The DI802 is an 8 channel 120 V a.c./d.c. digital input module for the S800 I/O. This module has 8 digital inputs. The a.c. input voltage range is 77 - 130 volt and the input current is 10 mA at 120 V a.c. The d.c. input range is 75 - 145 V and the input current is 2.8 mA at 110 V. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Channel 8 can be used as process voltage supervision input for channels 1-7. If process voltage supervision is enabled, channels 1-7 will indicate channel error unless a high level voltage is applied on channel 8. The detection time for this supervision is 70 ms. If process voltage supervision is disabled channel 8 can be used as a normal input channel.





If the voltage connected to channel 8 disappears, the error inputs are activated. The error signal can be read from the ModuleBus. This supervision can be enabled/disabled with parameter “a”. If the error inputs are disabled, channel 8 can be used as the normal input channel.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

### Technical Data

Table 45. DI802 Digital Input Module Specifications

Feature	DI802 Digital Input Module
Number of channels	8, current sinking
Rated voltage (process power supply range)	120 V a.c. (77 to 130 V a.c.) 110 V d.c. (75 to 145 V d.c.)
Input voltage range, “1”	77 to 130 V a.c. 75 to 145 V d.c.
Input voltage range, “0”	0 to 30 V a.c. 0 to 20 V d.c.
Nominal input channel current	10 mA a.c. @ 120 V a.c. 2.8 mA d.c. @ 110 V d.c.
Input frequency range a.c.	47...63 Hz
Input Impedance	12 k $\Omega$ (a.c.) 39 k $\Omega$ (d.c.)
Maximum field cable length	200 meters (219 yd.) 100pF/m. for a.c. 600 meters (656 yd.) for d.c.

Table 45. DI802 Digital Input Module Specifications (Continued)

Feature	DI802 Digital Input Module
Filter times (digital, selectable)	2, 4, 8, 16 ms
Analog filter On/Off delay	5/18 ms
Process voltage supervision	Channel 8
Current consumption 5 V (Modulebus)	50 mA
Power dissipation <sup>(1)</sup>	2.8 W
Isolation	Individually isolated channels
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm <sup>2</sup> , 30-12 AWG Stranded: 0.05-1.5mm <sup>2</sup> , 30-12 AWG Recommended torque: 0.5 - 0.6Nm Stripping length: 6-7.5 mm, 0.24-0.30 in

(1) Power dissipation is calculated with 70 percent of the channels activated.

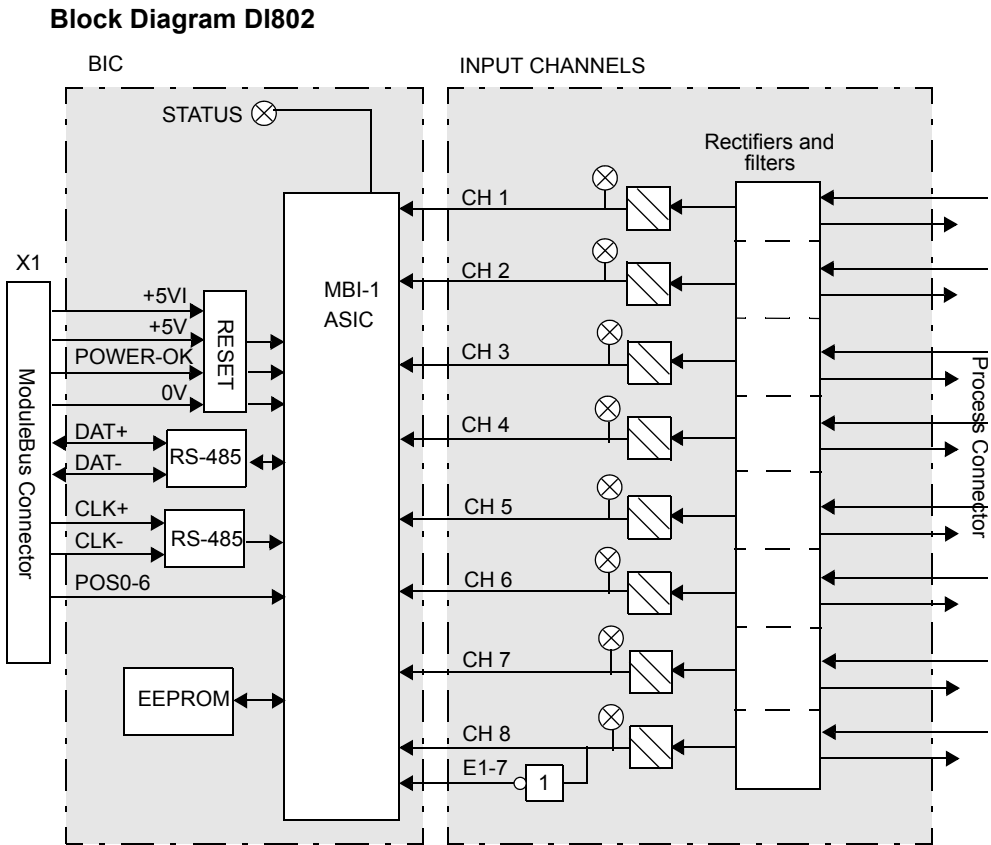


Figure 90. DI802 Block Diagram

Process Connections

Table 46. DI802 Process Connections

Process Connection	Process Terminal
Ch1 Input	1A
	1B
Ch 2 Input	2A
	2B
Ch 3 Input	3A
	3B
Ch 4 Input	4A
	4B
Ch 5 Input	5A
	5B
Ch 6 Input	6A
	6B
Ch 7 Input	7A
	7B
Ch 8 Input	8A
	8B

Figure 91 shows the process connections for the DI802.

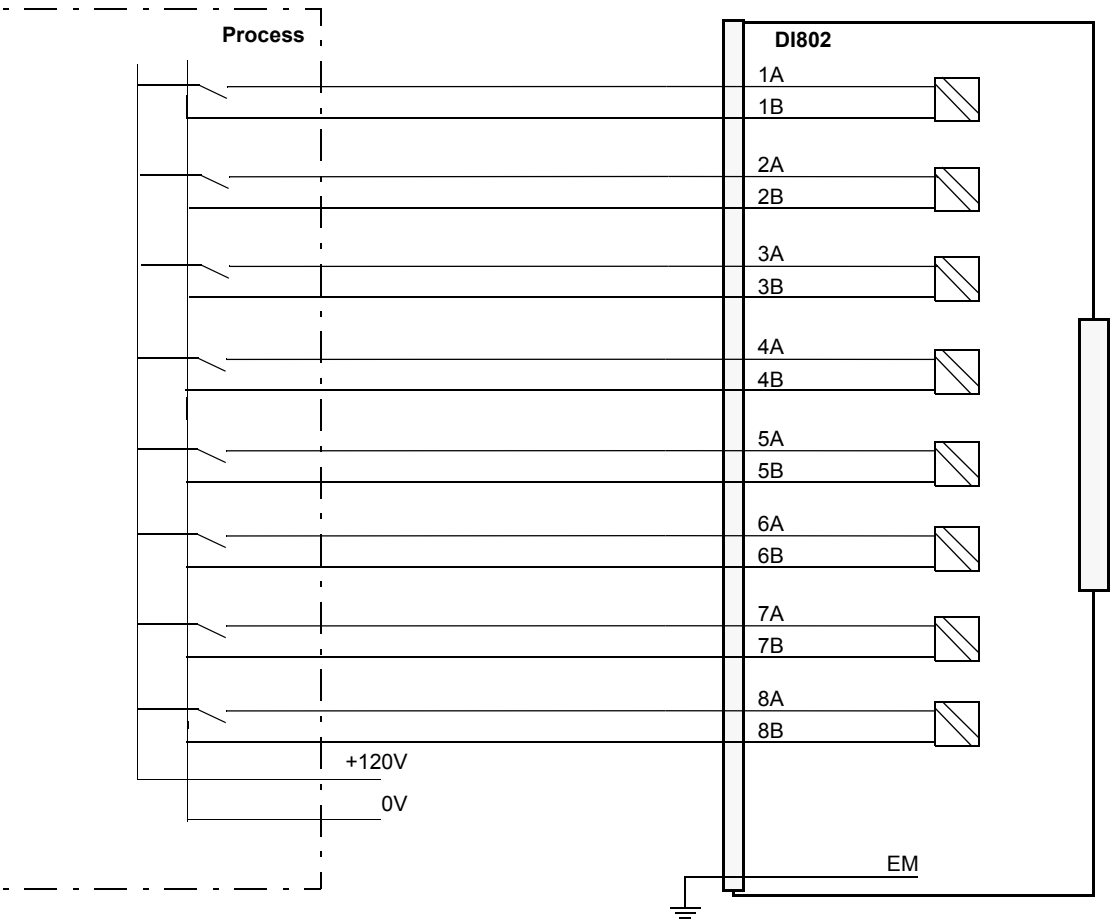


Figure 91. DI802 Process Connections

## DI803 Digital Input Module, 230 V a.c./d.c, Current Sinking

### Features

- 8 channels for 230 V a.c./d.c. inputs with current sinking.
- Individually isolated channels.
- Voltage supervision of field input power.
- Input status indicators.
- Signal filtering.
- Process connection via detachable connectors.

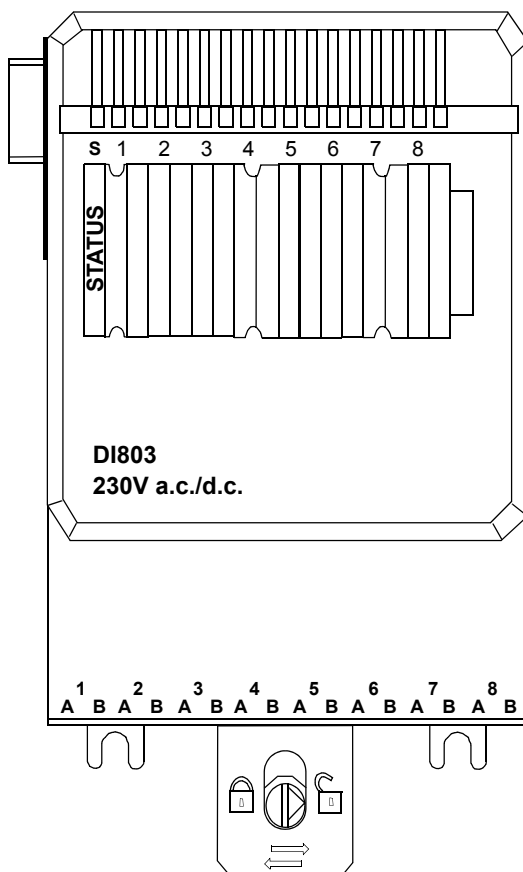
### Description

The DI803 is an 8 channel 230 V a.c./d.c. digital input module for the S800 I/O. This module has 8 digital inputs. The a.c. input voltage range is 164 - 264 volt and the input current is 7.6 mA at 230 V a.c. The d.c. input range is 175 - 275 V and the input current is 1.6 mA at 220 V. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Channel 8 can be used as process voltage supervision input for channels 1-7.

If process voltage supervision is enabled, channels 1-7 will indicate channel error unless a high level voltage is applied on channel 8. The detection time for this



supervision is 70 ms. If process voltage supervision is disabled channel 8 can be used as a normal input channel.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

### Technical Data

Table 47. DI803 Digital Input Module Specifications

Feature	DI803 Digital Input Module
Number of channels	8, current sinking
Rated voltage (process power supply range)	230 V a.c. (164 to 264 V a.c.) 220 V d.c. (175 to 275 V d.c.)
Input voltage range, "1"	164 to 264 V a.c. 175 to 275 V d.c.
Input voltage range, "0"	0 to 50 V a.c. 0 to 40 V d.c.
Nominal input channel current	7.6 mA @ 230 V a.c. (PR:A) 11mA @ 230 V a.c. (from PR:B) 1.6mA @220V d.c
Input frequency range, a.c.	47...63 Hz
Input impedance	30 k $\Omega$ (a.c.) 134 k $\Omega$ (d.c.)
Maximum field cable length	200 meters (219 yd.) 100pF/m. for a.c. 600 meters (656 yd.) for d.c.
Filter times (digital, selectable)	2, 4, 8, 16 ms

Table 47. DI803 Digital Input Module Specifications (Continued)

Feature	DI803 Digital Input Module
Analog filter On/Off delay	5/28 ms
Process voltage supervision	Channel 8
Current consumption 5 V (Modulebus)	50 mA
Power dissipation <sup>(1)</sup>	2.8 W
Isolation	Individually isolated channels
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm <sup>2</sup> , 30-12 AWG Stranded: 0.05-1.5mm <sup>2</sup> , 30-12 AWG Recommended torque: 0.5 - 0.6Nm Stripping length: 6-7.5 mm, 0.24-0.30 in

(1) Power dissipation is calculated with 70 percent of the channels activated.



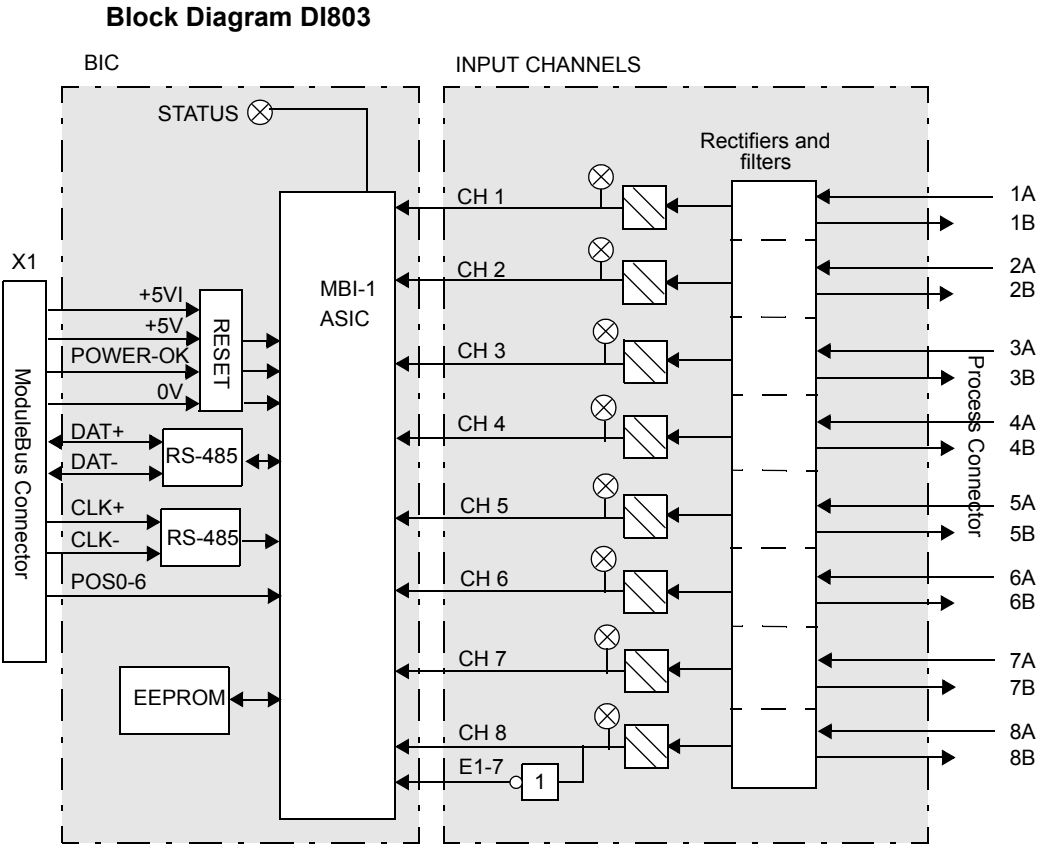


Figure 92. DI803 Block Diagram

Process Connections

Table 48. DI803 Process Connections

Process Connection	Process Terminal
Ch1 Input	1A
	1B
Ch 2 Input	2A
	2B
Ch 3 Input	3A
	3B
Ch 4 Input	4A
	4B
Ch 5 Input	5A
	5B
Ch 6 Input	6A
	6B
Ch 7 Input	7A
	7B
Ch 8 Input	8A
	8B

Figure 93 shows the process connections for the DI803.

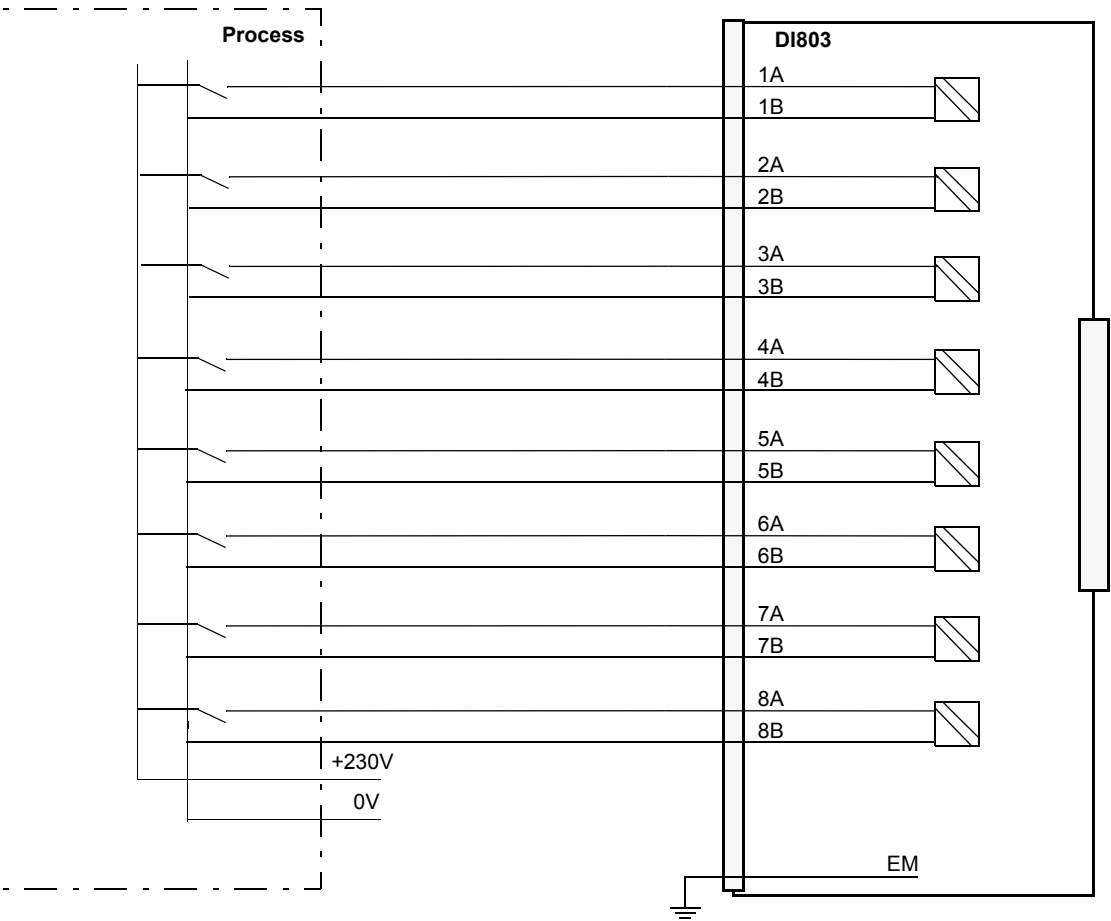


Figure 93. DI803 Process Connections

## DI810 Digital Input Module, 24 V, Current Sinking

### Features

- 16 channels for 24 V d.c. inputs with current sinking.
- Two isolated groups of 8 with voltage supervision.
- Input status indicators.

### Description

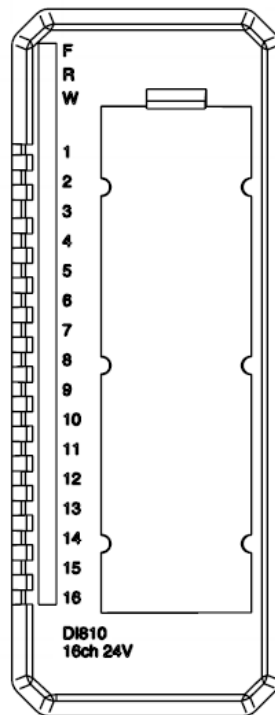
The DI810 is a 16 channel 24 V digital input module for the S800 I/O. This module has 16 digital inputs. The input voltage range is 18 to 30 volt d.c. and the input current is 6 mA at 24 V. The inputs are divided into two individually isolated groups with eight channels and one voltage supervision input in each group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

If voltage supervision is enabled, channels 1-8 and 9-16 will indicate channel error if the process voltage for its channel group fails.

The detection time for this supervision is 70 ms.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time are filtered out, and pulses longer than 3, 6, 12 and 24 ms get through the filter.



Eight different types of MTUs can be used. The TU830/TU833 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage supervision inputs, but requires external terminals for distribution of 24 V power supply to the devices. The TU818 Compact MTU provides connection to 2-wire sensors without external marshaling. The TU838 extended MTU, provides a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. TU850 provides one disconnectable PTC fused sensor/transmitter power outlet terminal per channel.

### Technical Data

Table 49. DI810 Digital Input Module Specifications

Feature	DI810 Digital Input Module
Number of channels	16 (2 x 8), current sinking
Rated voltage (process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	15 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	6 mA @ 24 V d.c.
Input Current "1"	>3.0mA
Input Current "0"	<1.0mA
Input Impedance	3.5 k $\Omega$
Maximum field cable length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	2 channels (1 per group)
Current consumption 5 V (Modulebus)	50 mA
Power dissipation <sup>(1)</sup>	1.8 W

Table 49. DI810 Digital Input Module Specifications (Continued)

Feature	DI810 Digital Input Module
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU838 or TU850.
MTU keying code	AA
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volts.

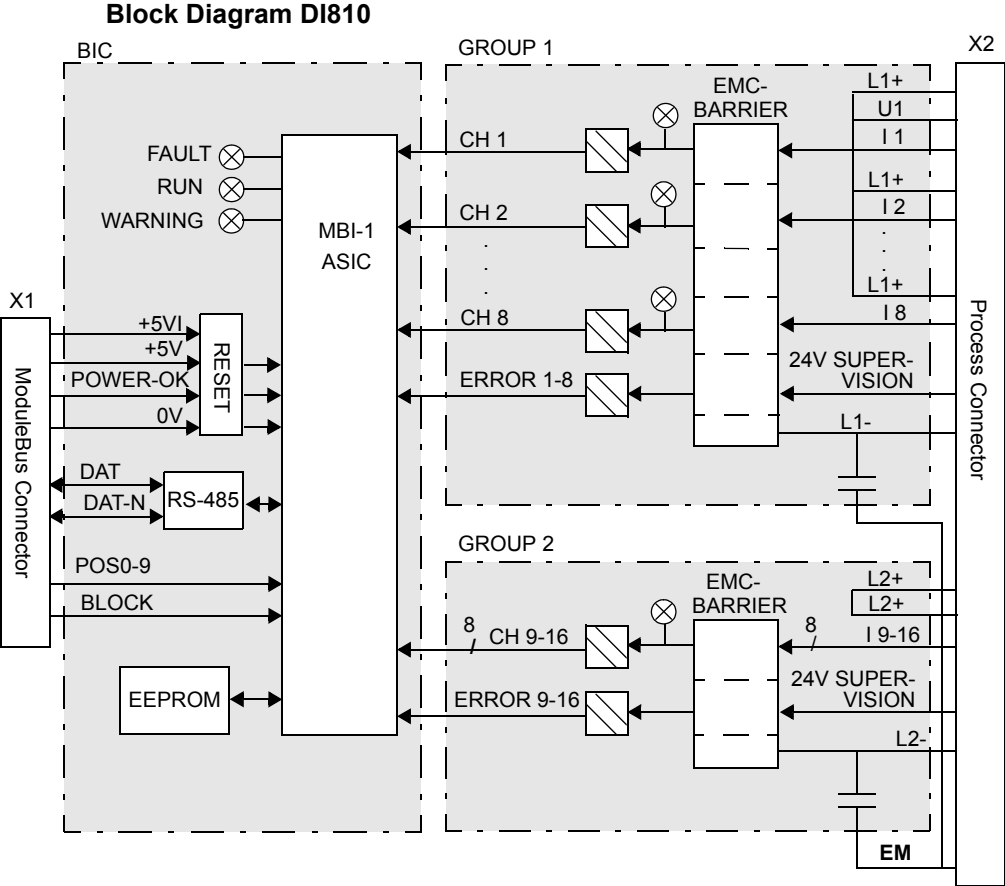


Figure 94. DI810 Block Diagram

**Process Connections***Table 50. DI810 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 Male Connector (1)</b>	<b>TU818 Terminal</b>	<b>TU830/TU833 Terminal</b>	<b>TU838 Terminal</b>	<b>TU850 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	C1, A1	B1, B2	A1 (F1)	A1, A2
Ch1 Input	C1	3	D1	C1	B1	B1
Ch 2 Input	B1	16	B1	C2	B2	B2
Ch1/Ch2, L1-	A1	-	-	A1, A2	A2	-
Ch 3/Ch 4, L1+	-	-	C2, A2	B3, B4	A3 (F2)	A3, A4
Ch 3 Input	C2	4	D2	C3	B3	B3
Ch 4 Input	B2	17	B2	C4	B4	B4
Ch 3/Ch 4, L1-	A2	-	-	A3, A4	A4	-
Ch 5/Ch 6, L1+	-	-	C3, A3	B5, B6	A5 (F3)	A5, A6
Ch 5 Input	C3	5	D3	C5	B5	B5
Ch 6 Input	B3	18	B3	C6	B6	B6
Ch 5/Ch 6, L1-	A3	-	-	A5, A6	A6	-
Ch 7/Ch 8, L1+	-	-	C4, A4	B7, B8	A7 (F4)	A7, A8



Table 50. DI810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830/TU833 Terminal	TU838 Terminal	TU850 Terminal
Ch 7 Input	C4	6	D4	C7	B7	B7
Ch 8 Input	B4	19	B4	C8	B8	B8
Ch 7/Ch 8, L1-	A4	-	-	A7, A8	A8	-
Ch 9/Ch 10, L2+	-	-	C5, A5	B9, B10	A9 (F5)	A9, A10
Ch 9 Input	C5	7	D5	C9	B9	B9
Ch 10 Input	B5	20	B5	C10	B10	B10
Ch 9/Ch 10, L2-	A5	-	-	A9, A10	A10	-
Ch 11/Ch 12, L2+	-	-	C6, A6	B11, B12	A11 (F6)	A11, A12
Ch 11 Input	C6	8	D6	C11	B11	B11
Ch 12 Input	B6	21	B6	C12	B12	B12
Ch 11/Ch 12, L2-	A6	-	-	A11, A12	A12	-
Ch 13/Ch 14, L2+	-	-	C7, A7	B13, B14	A13 (F7)	A13, A14
Ch 13 Input	C7	9	D7	C13	B13	B13
Ch 14 Input	B7	22	B7	C14	B14	B14
Ch 13/Ch 14, L2-	A7	-	-	A13, A14	A14	-

Table 50. DI810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830/TU833 Terminal	TU838 Terminal	TU850 Terminal
Ch 15/ Ch16, L2+	-	-	C8, A8	B15, B16	A15 (F8)	A15, A16
Ch 15 Input	C8	10	D8	C15	B15	B15
Ch 16 Input	B8	23	B8	C16	B16	B16
Ch 15/Ch16, L2-	A8	-	-	A15, A16	A16	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 95 shows the process connections for the Digital Input Module DI810 when installed on a TU830 Extended MTU.

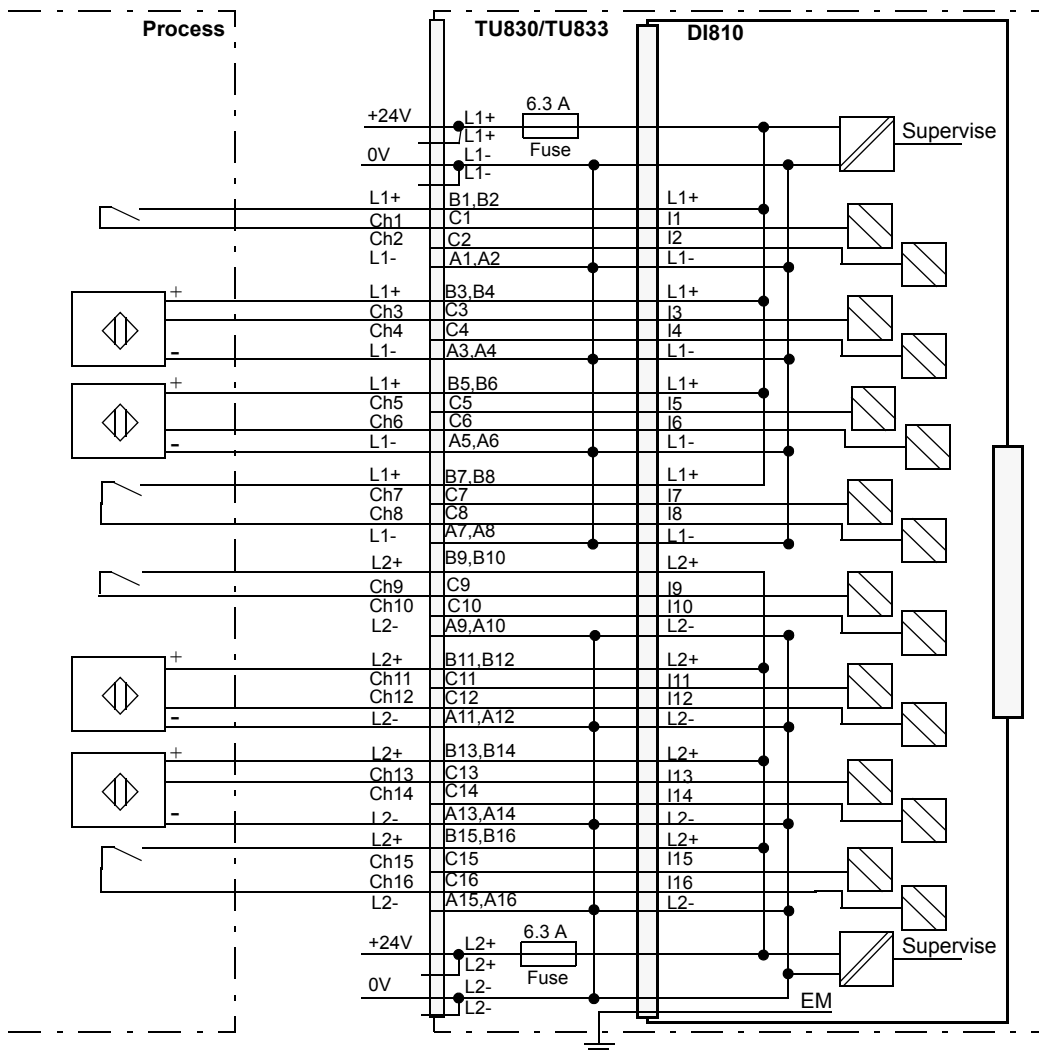


Figure 95. DI810 with TU830 Extended MTU Process Connections

Figure 96 shows the process connections for the Digital Input Module DI810 when installed on a TU838 Extended MTU.

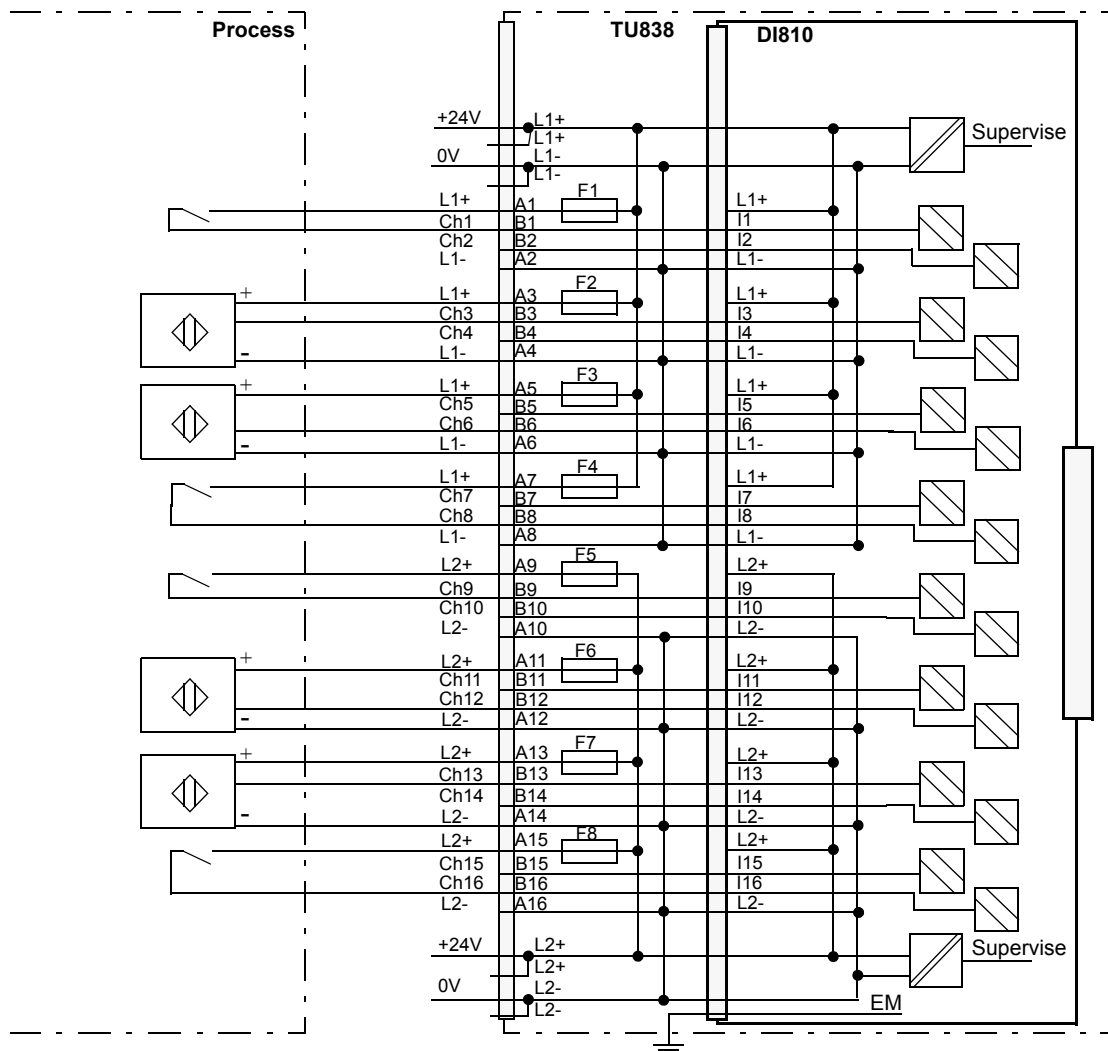


Figure 96. DI810 with TU838 Extended MTU Process Connections

Figure 97 shows the process connections for the DI810 when installed on a TU810 or TU814 Compact MTU.

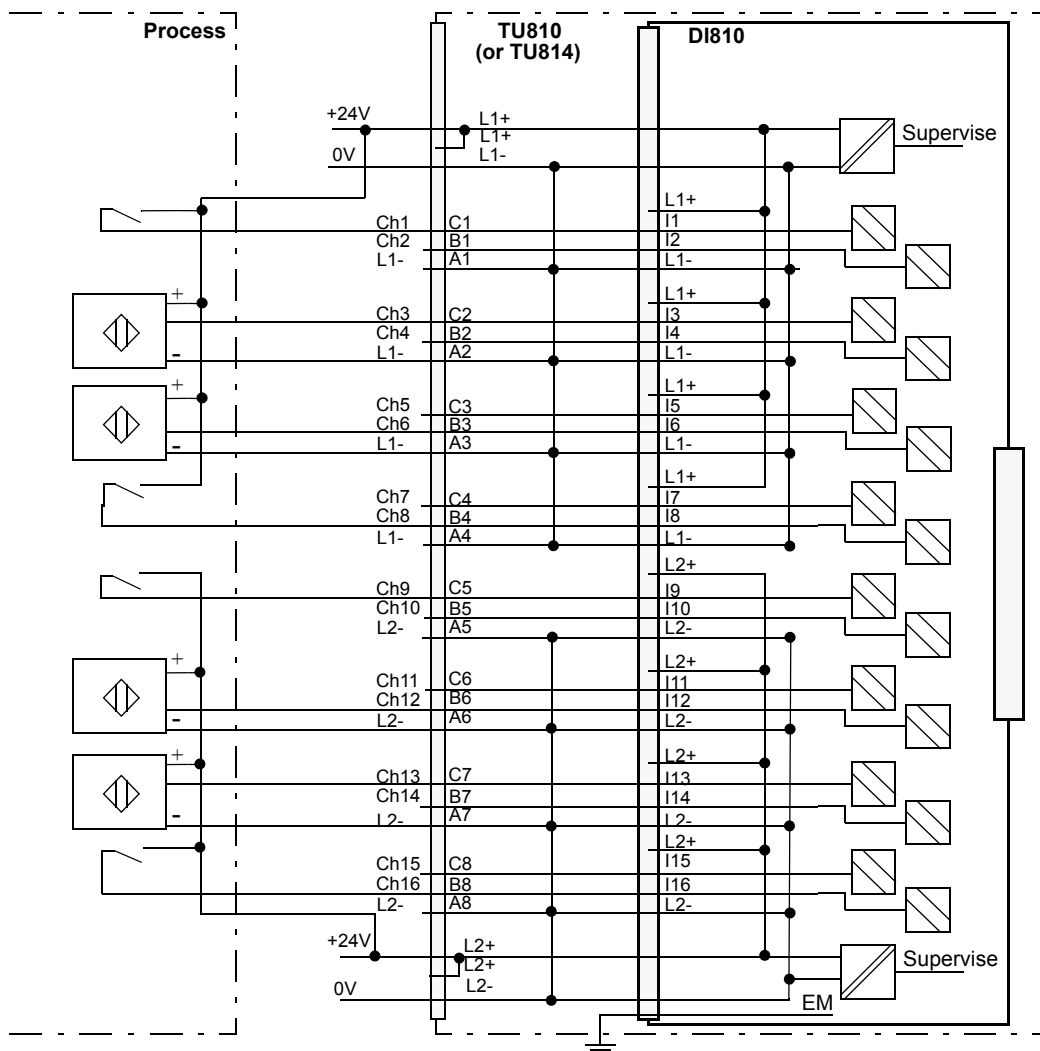


Figure 97. DI810 with TU810 or TU814 Compact MTU Process Connections

Figure 98 shows the process connections for the DI810 when installed on a TU812 Compact MTU.

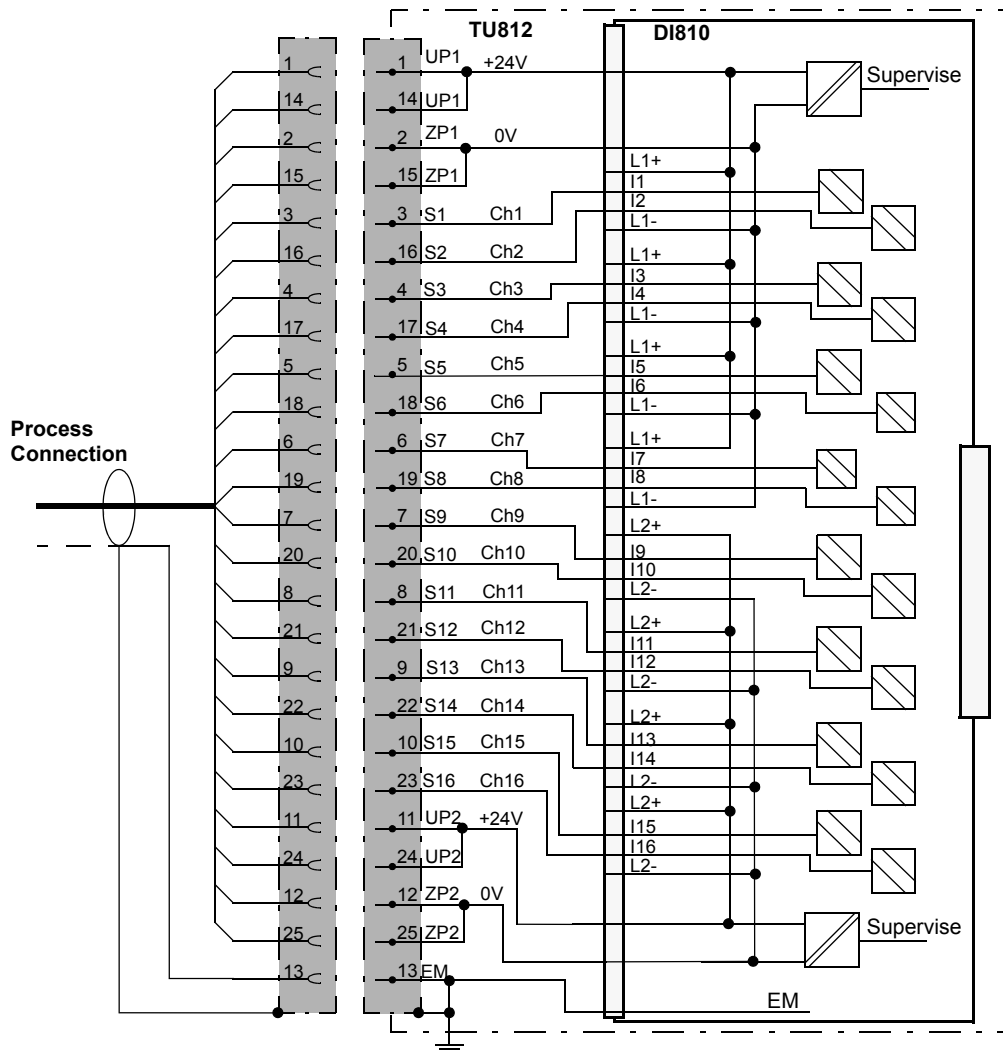


Figure 98. DI810 with TU812 Compact MTU Process Connections

Figure 99 shows the process connection for the DI810 when installed on a TU850 Extended.

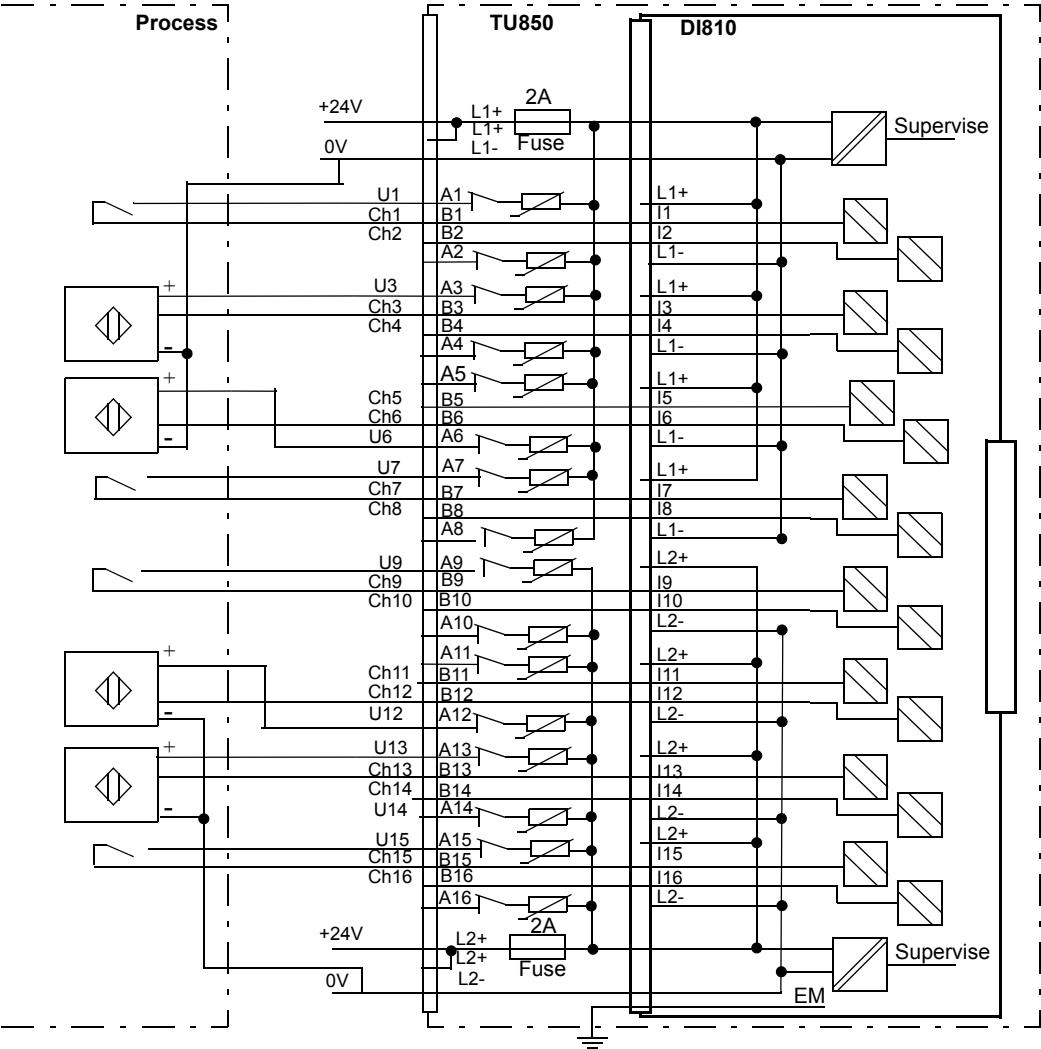


Figure 99. DI810 with TU850 Extended MTU Process Connection

Figure 100 shows the process connections for the DI810 when installed on a TU818 Compact MTU.

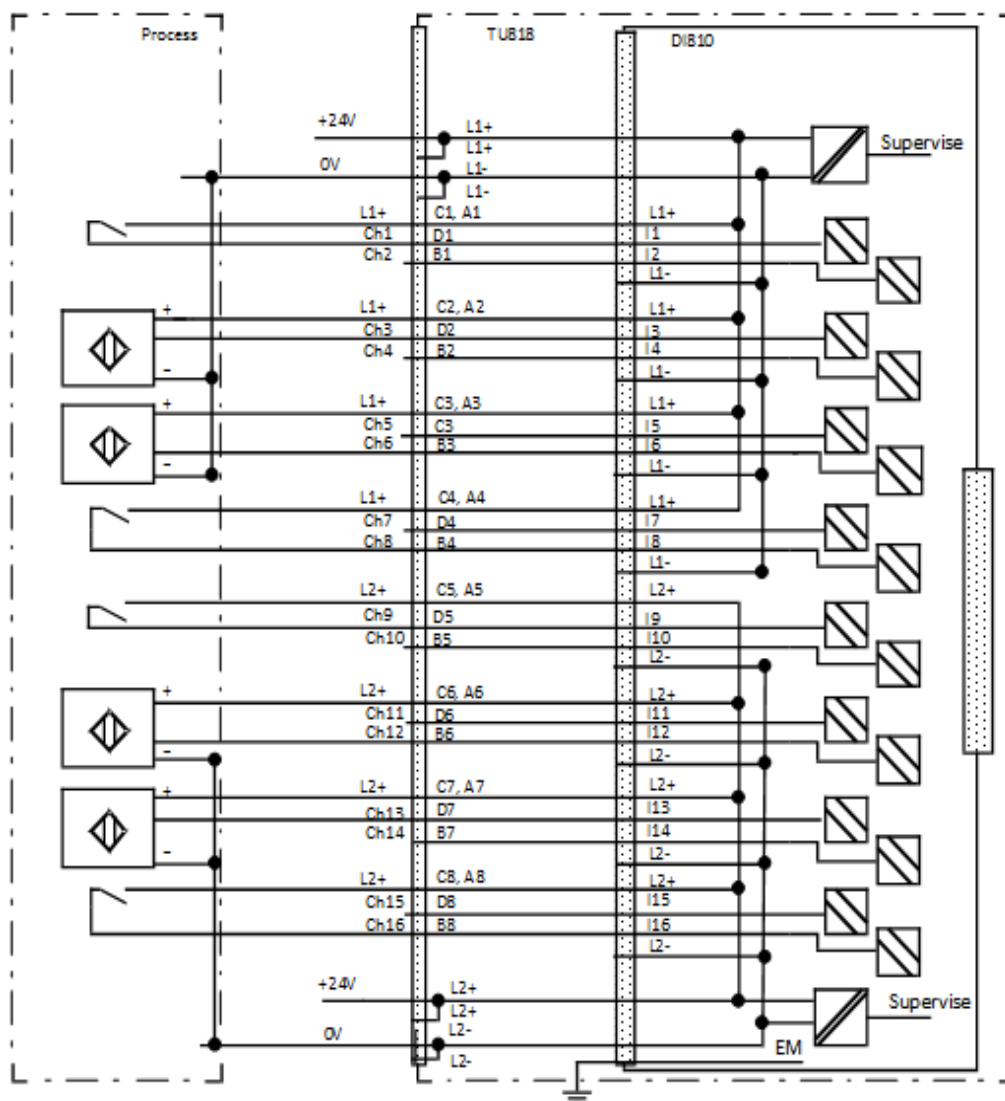


Figure 100. DI810 with TU818 Compact MTU Process Connections



Figure 101 shows the process connection for the DI810 when installed on a TU850 Extended.

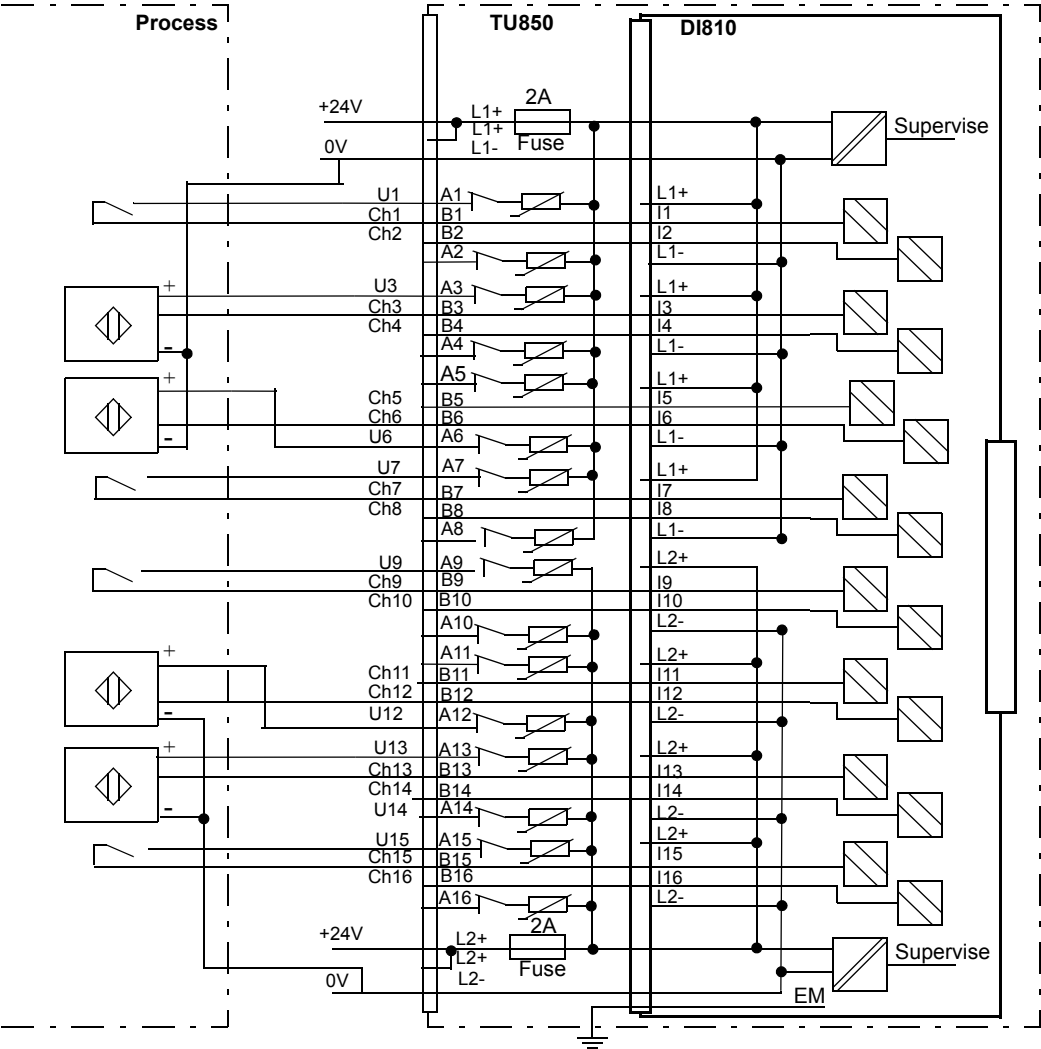


Figure 101. DI810 with TU850 Extended MTU Process Connection

## DI811 Digital Input Module, 48 V, Current Sinking

### Features

- 16 channels for 48 V d.c. inputs with current sinking.
- 2 isolated groups of 8 with voltage supervision.
- Input status indicators.

### Description

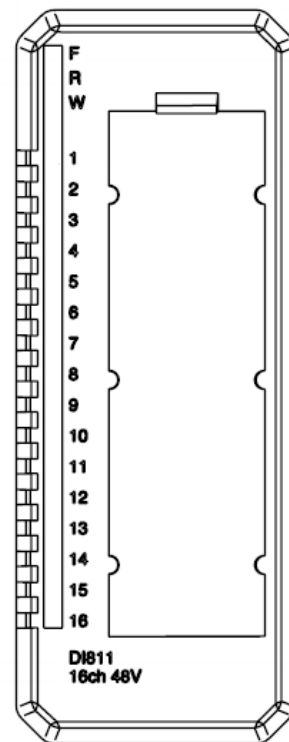
The DI811 is a 16 channel 48 V digital input module for the S800 I/O. This module has 16 digital inputs. The input signal voltage range is 36 to 60 volt d.c. and the input current is 4 mA at 48 V. The inputs are divided into two individually isolated groups with eight channels and one voltage supervision input in each group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

If voltage supervision is enabled, channels 1-8 and 9-16 will indicate channel error if the process voltage for its channel group fails.

The detection time for this supervision is 70 ms.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time are filtered out, and pulses longer than 3, 6, 12 and 24 ms get through the filter.



Eight different types of MTUs can be used. The TU830/TU833 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 48 V process voltage supervision inputs, but requires external terminals for distribution of 48 V power supply to the devices. The TU818 Compact MTU provides connection to 2-wire sensors without external marshaling. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. TU850 provides one disconnectable PTC fused sensor/transmitter power outlet terminal per channel.

### Technical Data

Table 51. DI811 Digital Input Module Specifications

Feature	DI811 Digital Input Module
Number of channels	16 (2 x 8), current sinking
Rated voltage (process power supply range)	48 V d.c. (36 to 60 V d.c.)
Input signal voltage range, "1"	30 to 60 V
Input signal voltage range, "0"	-60 to +10 V
Nominal input channel current	4 mA @ 48 V d.c.
Input Current, "1"	>2.0 mA
Input Current, "0"	<0.5 mA
Input Impedance	11 kΩ
Maximum field cable length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	2 channels (1 per group)
Current consumption 5 V (Modulebus)	50 mA
Power dissipation <sup>(1)</sup>	2.7 W

Table 51. DI811 Digital Input Module Specifications (Continued)

Feature	DI811 Digital Input Module
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU838 or TU850
MTU keying code	BD
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 48 Volts.

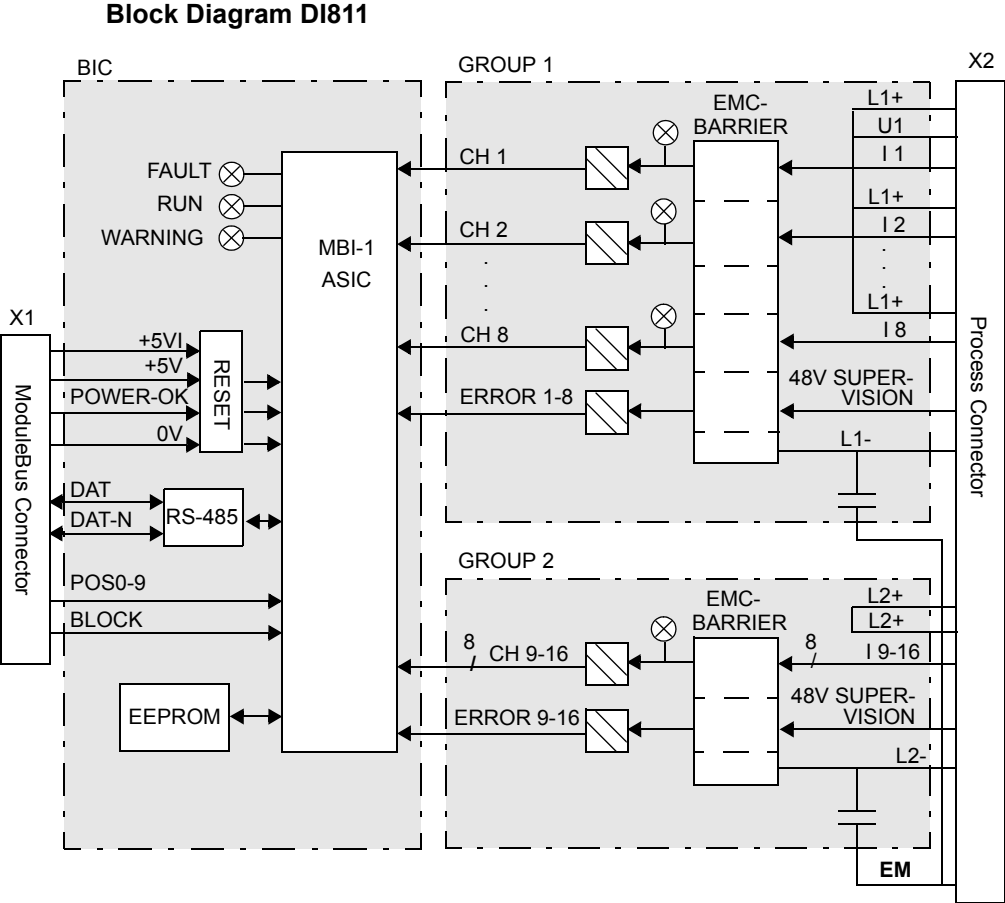


Figure 102. DI811 Block Diagram

**Process Connections***Table 52. DI811 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector (1)</b>	<b>TU818 Terminal</b>	<b>TU830/TU833 Terminal</b>	<b>TU838 Terminal</b>	<b>TU850 Terminal</b>
+48 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	C1, A1	B1, B2	A1 (F1)	A1, A2
Ch1 Input	C1	3	D1	C1	B1	B1
Ch 2 Input	B1	16	B1	C2	B2	B2
Ch1/Ch2, L1-	A1	-	-	A1, A2	A2	-
Ch 3/Ch 4, L1+	-	-	C2, A2	B3, B4	A3 (F2)	A3, A4
Ch 3 Input	C2	4	D2	C3	B3	B3
Ch 4 Input	B2	17	B2	C4	B4	B4
Ch 3/Ch 4, L1-	A2	-	-	A3, A4	A4	-
Ch 5/Ch 6, L1+	-	-	C3, A3	B5, B6	A5 (F3)	A5, A6
Ch 5 Input	C3	5	D3	C5	B5	B5
Ch 6 Input	B3	18	B3	C6	B6	B6
Ch 5/Ch 6, L1-	A3	-	-	A5, A6	A6	-
Ch 7/Ch 8, L1+	-	-	C4, A4	B7, B8	A7 (F4)	A7, A8
Ch 7 Input	C4	6	D4	C7	B7	B7
Ch 8 Input	B4	19	B4	C8	B8	B8
Ch 7/Ch8, L1-	A4	-	-	A7, A8	A8	-
Ch 9/Ch 10, L2+	-	-	C5, A5	B9, B10	A9 (F5)	A9, A10

Table 52. DI811 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector (1)	TU818 Terminal	TU830/TU833 Terminal	TU838 Terminal	TU850 Terminal
Ch 9 Input	C5	7	D5	C9	B9	B9
Ch 10 Input	B5	20	B5	C10	B10	B10
Ch 9/Ch 10, L2-	A5	-		A9, A10	A10	-
Ch 11/Ch 12, L2+	-	-	C6, A6	B11, B12	A11 (F6)	A11, A12
Ch 11 Input	C6	8	D6	C11	B11	B11
Ch 12 Input	B6	21	B6	C12	B12	B12
Ch 11/Ch 12, L2-	A6	-	-	A11, A12	A12	-
Ch 13/Ch 14, L2+	-	-	C7, A7	B13, B14	A13 (F7)	A13, A14
Ch 13 Input	C7	9	D7	C13	B13	B13
Ch 14 Input	B7	22	B7	C14	B14	B14
Ch 13/Ch 14, L2-	A7	-	-	A13, A14	A14	-
Ch 15/ Ch16, L2+	-	-	C8, A8	B15, B16	A15 (F8)	A15, A16
Ch 15 Input	C8	10	D8	C15	B15	B15
Ch 16 Input	B8	23	B8	C16	B16	B16
Ch 15/Ch16, L2-	A8	-	-	A15, A16	A16	-
+48 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 103 shows the process connections for the Digital Input Module DI811 when installed on a TU830 Extended MTU.

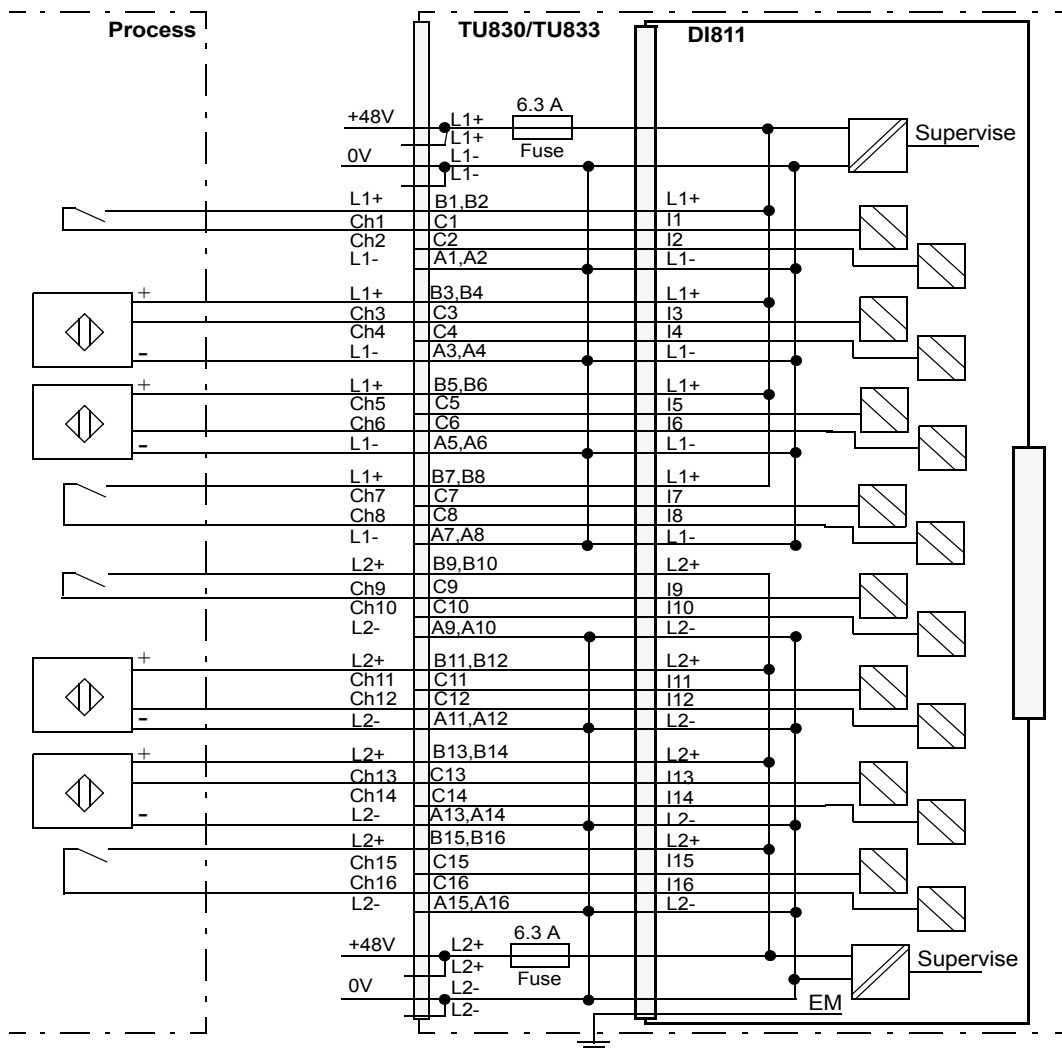


Figure 103. DI811 with TU830 Extended MTU Process Connections



Figure 104 shows the process connections for the Digital Input Module DI811 when installed on a TU838 Extended MTU.

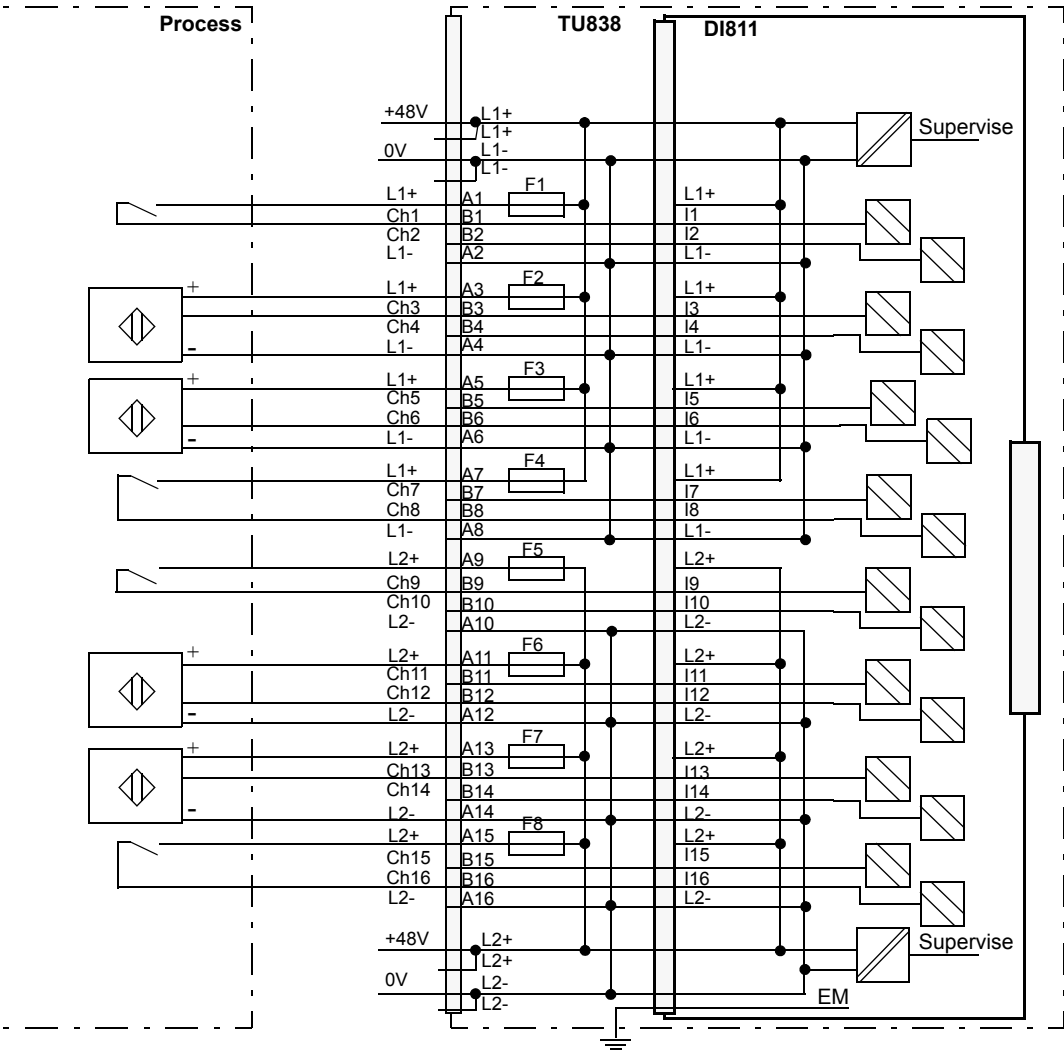


Figure 104. DI811 with TU838 Extended MTU Process Connections

Figure 105 shows the process connections for the DI811 when installed on a TU810 or TU814 Compact MTU.

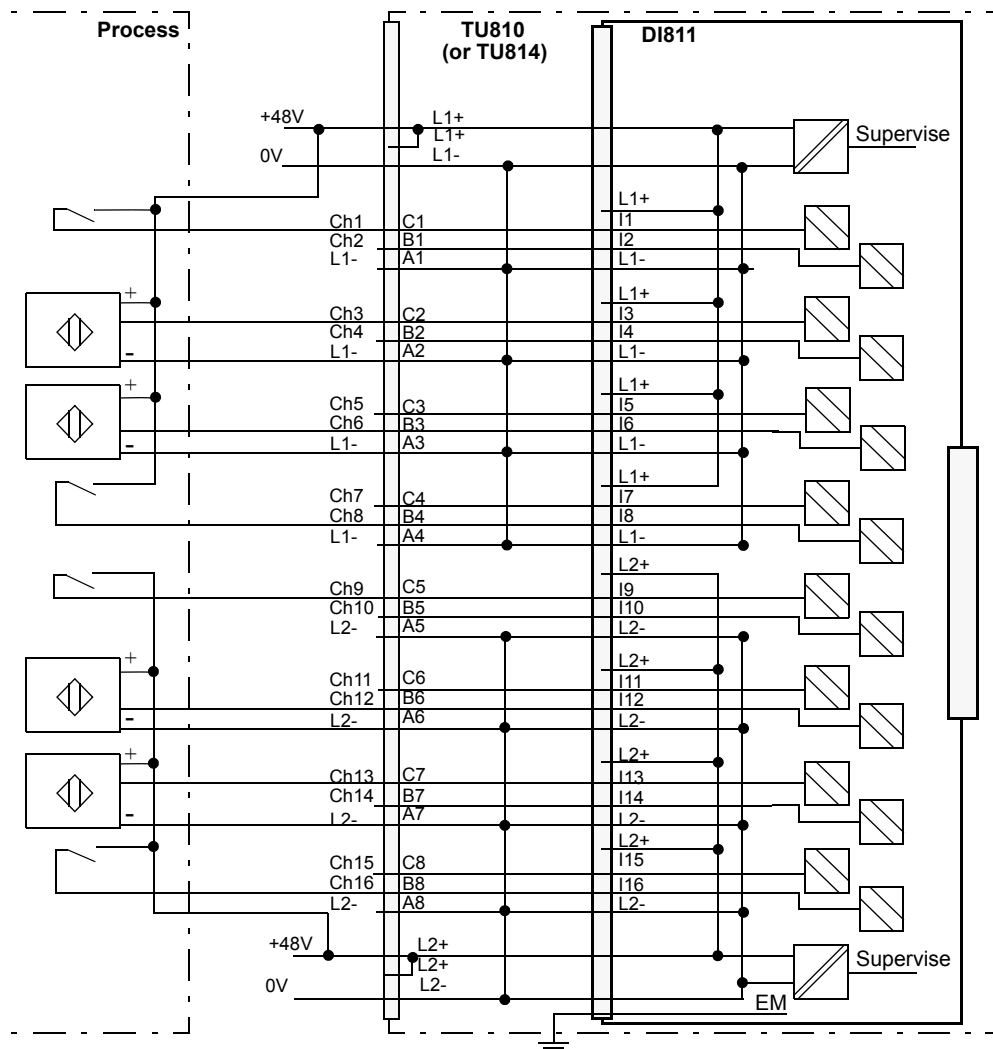


Figure 105. DI811 with TU810 or TU814 Compact MTU Process Connections

Figure 106 shows the process connections for the DI811 when installed on a TU812 Compact MTU

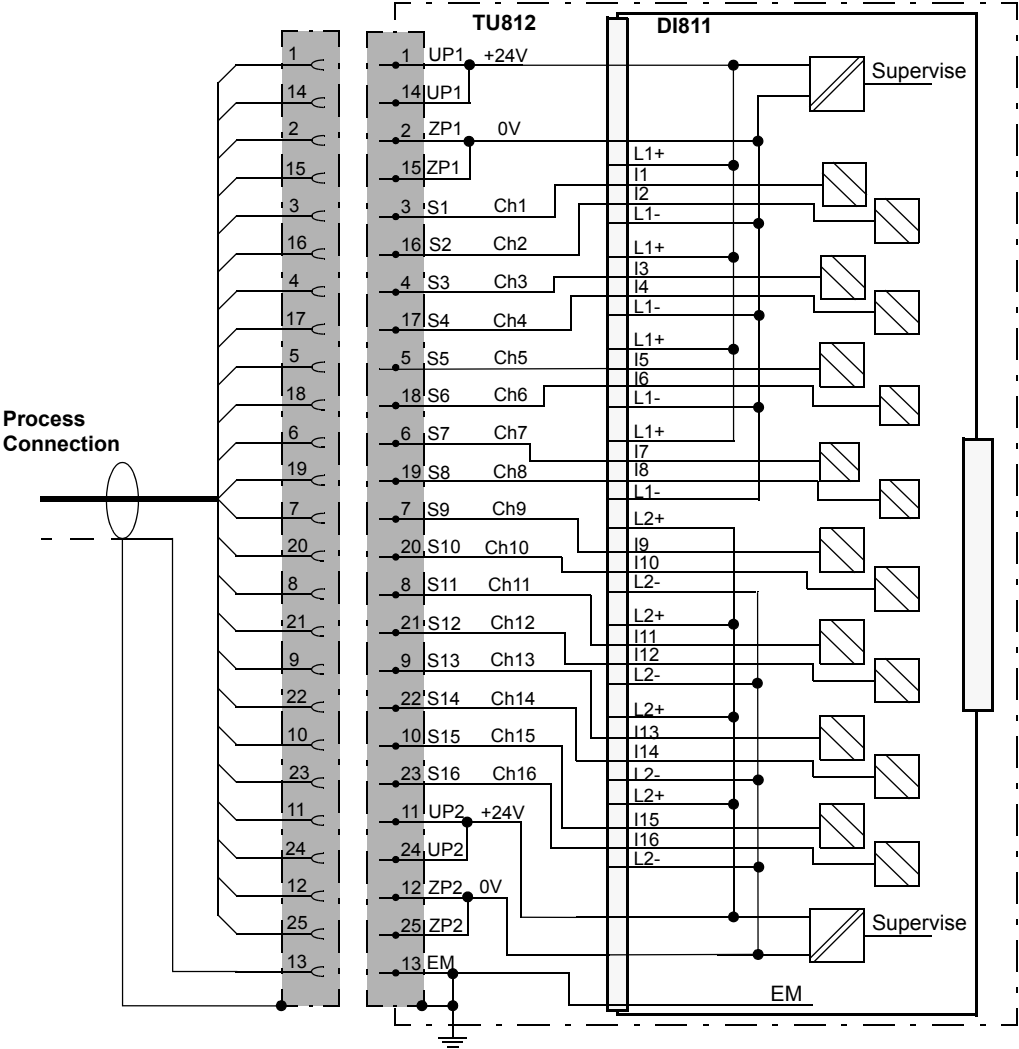


Figure 106. DI811with TU812

Figure 107 shows the process connections for the DI811 when installed on a TU850 Extended MTU.

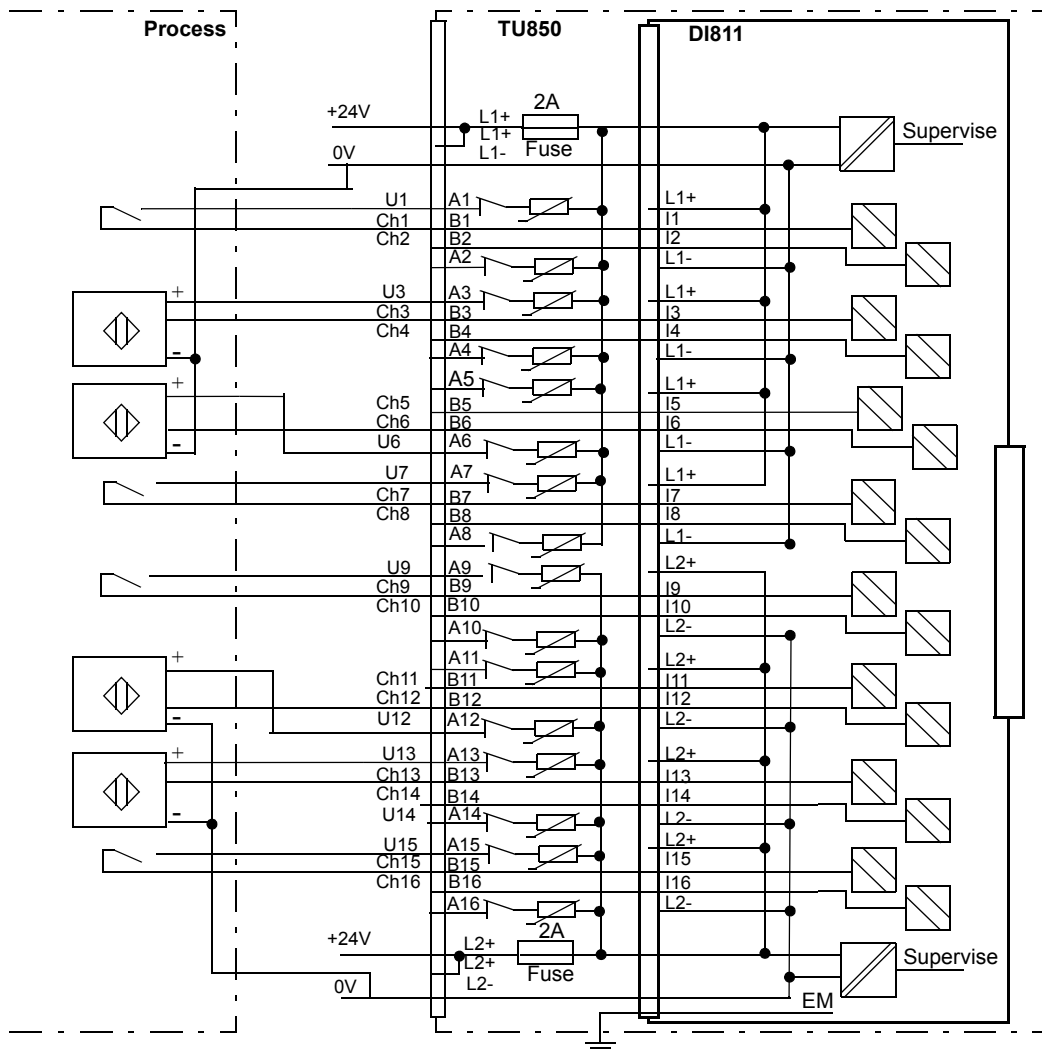


Figure 107. DI811 with TU850 Extended MTU Process Connections

Figure 108 shows the process connections for the Digital Input Module DI811 when installed on a TU818 Compact MTU.

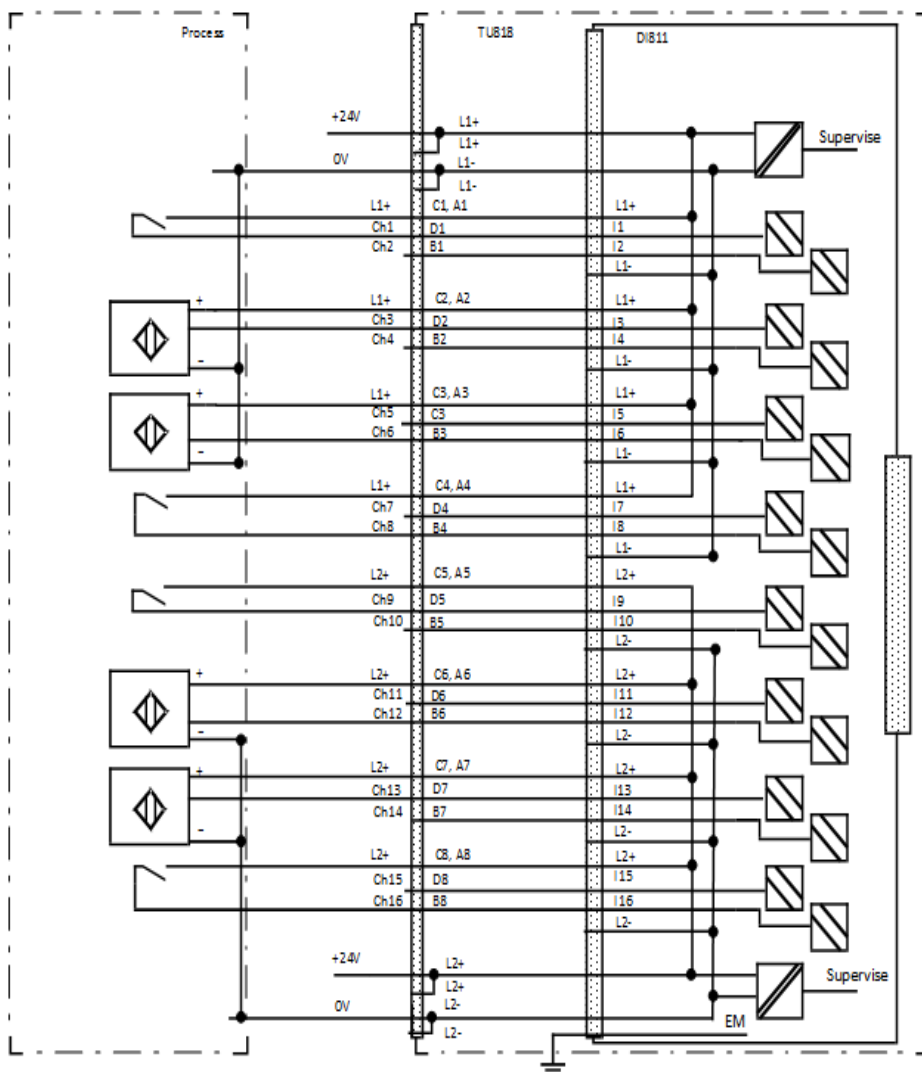


Figure 108. DI811 with TU818 Compact MTU Process Connections

## DI814 Digital Input Module, 24 V, Current Sourcing

### Features

- 16 channels for 24 V d.c. inputs with current sourcing.
- 2 Isolated groups of 8 with voltage supervision.
- Input status indicators.

### Description

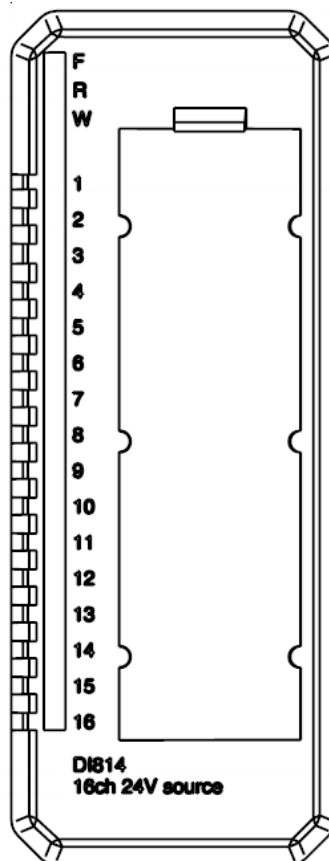
The DI814 is a 16 channel 24 V digital input module with current sourcing for the S800 I/O. The input voltage range is 18 to 30 volt dc and the input current source is 6 mA at 24 V. The inputs are divided into two individually isolated groups with eight channels and one voltage supervision input in each group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

If voltage supervision is enabled, channels 1-8 and 9-16 will indicate channel error if the process voltage for its channel group fails.

The detection time for this supervision is 70 ms.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time are filtered out, and pulses longer than 3, 6, 12 and 24 ms get through the filter.



Five different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage supervision inputs, but requires external terminals for distribution of 24 V power supply to the devices. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

### Technical Data

Table 53. DI814 Digital Input Module Specifications

Feature	DI814 Digital Input Module
Number of channels	16 (2 x 8), current sourcing
Rated voltage (process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	15 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	6 mA @ 24 V d.c.
Input Current, "1"	>3.0 mA
Input Current, "0"	<1.0 mA
Input Impedance	3.5 k $\Omega$
Maximum Field Cable Length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	2 channels (1 per group)
Current consumption 5 V (Modulebus)	50 mA
Power dissipation <sup>(1)</sup>	1.8 W
Isolation	Groupwise isolated from ground

Table 53. DI814 Digital Input Module Specifications (Continued)

Feature	DI814 Digital Input Module
Module termination units	TU810, TU812, TU814, TU830 or TU838
MTU keying code	BE
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volts.



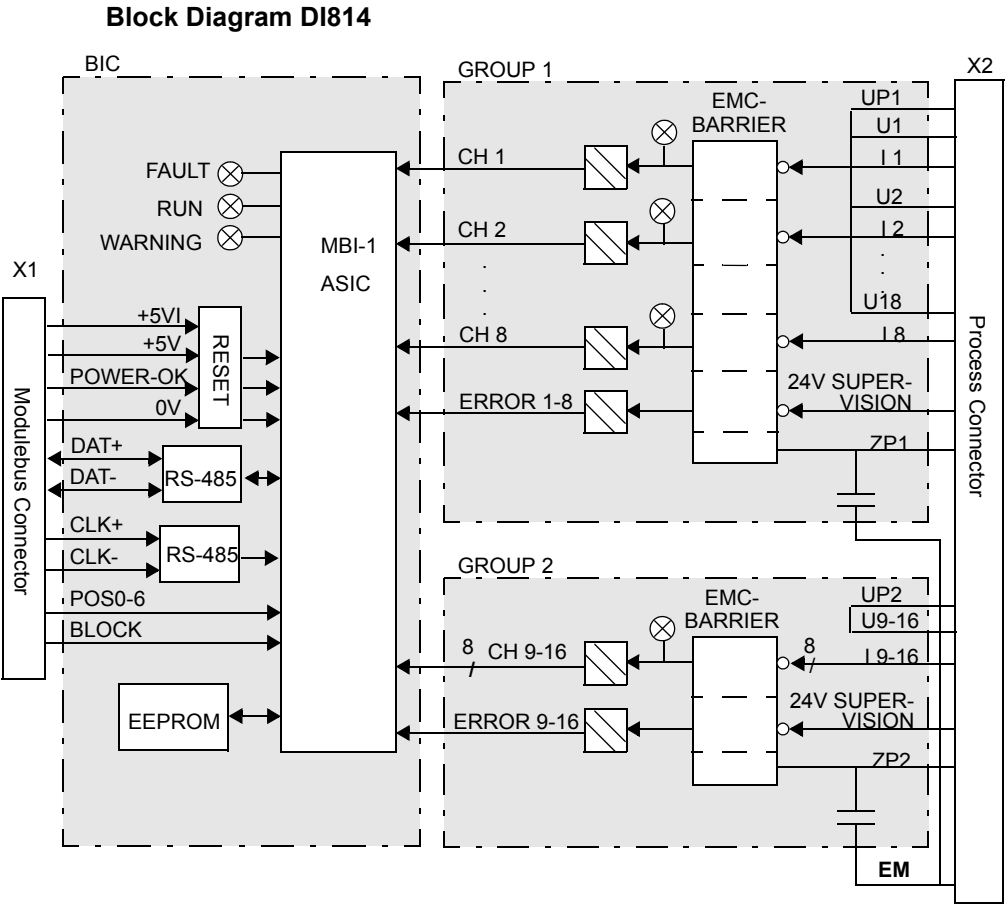


Figure 109. DI814 Block Diagram

**Process Connections***Table 54. DI814 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector <sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>	<b>TU838 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	B1, B2	A1 (F1)
Ch1 Input	C1	3	C1	B1
Ch 2 Input	B1	16	C2	B2
Ch1/Ch2, L1-	A1	-	A1, A2	A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)
Ch 3 Input	C2	4	C3	B3
Ch 4 Input	B2	17	C4	B4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)
Ch 5 Input	C3	5	C5	B5
Ch 6 Input	B3	18	C6	B6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)
Ch 7 Input	C4	6	C7	B7
Ch 8 Input	B4	19	C8	B8
Ch 7/Ch8, L1-	A4	-	A7, A8	A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)
Ch 9 Input	C5	7	C9	B9

Table 54. DI814 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal	TU838 Terminal
Ch 10 Input	B5	20	C10	B10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)
Ch 11 Input	C6	8	C11	B11
Ch 12 Input	B6	21	C12	B12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)
Ch 13 Input	C7	9	C13	B13
Ch 14 Input	B7	22	C14	B14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)
Ch 15 Input	C8	10	C15	B15
Ch 16 Input	B8	23	C16	B16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 110 shows the process connections for the Digital Input Module DI814 (current sourcing) when installed on a TU830 Extended MTU.

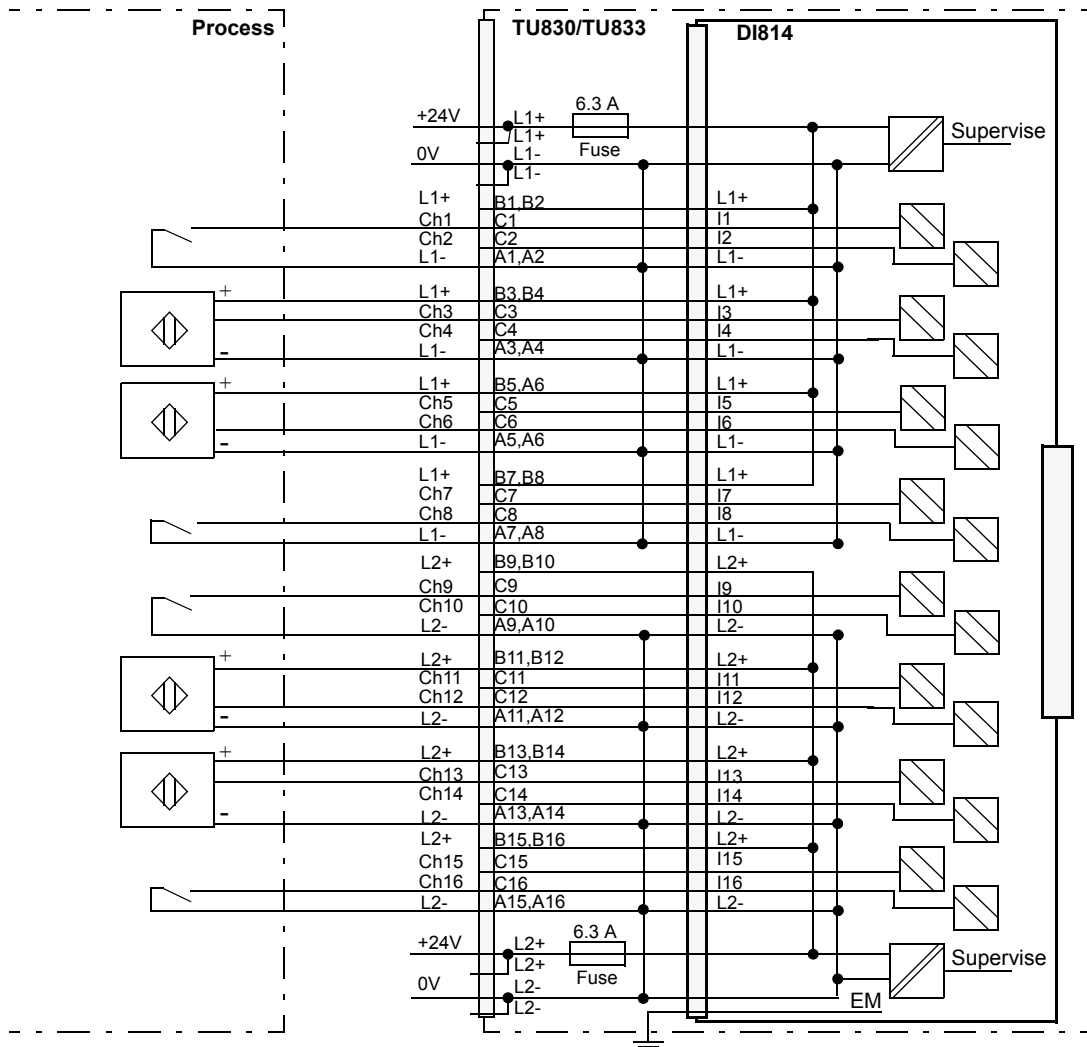


Figure 110. DI814 with TU830 Extended MTU Process Connections

Figure 111 shows the process connections for the Digital Input Module DI814 (current sourcing) when installed on a TU838 Extended MTU.

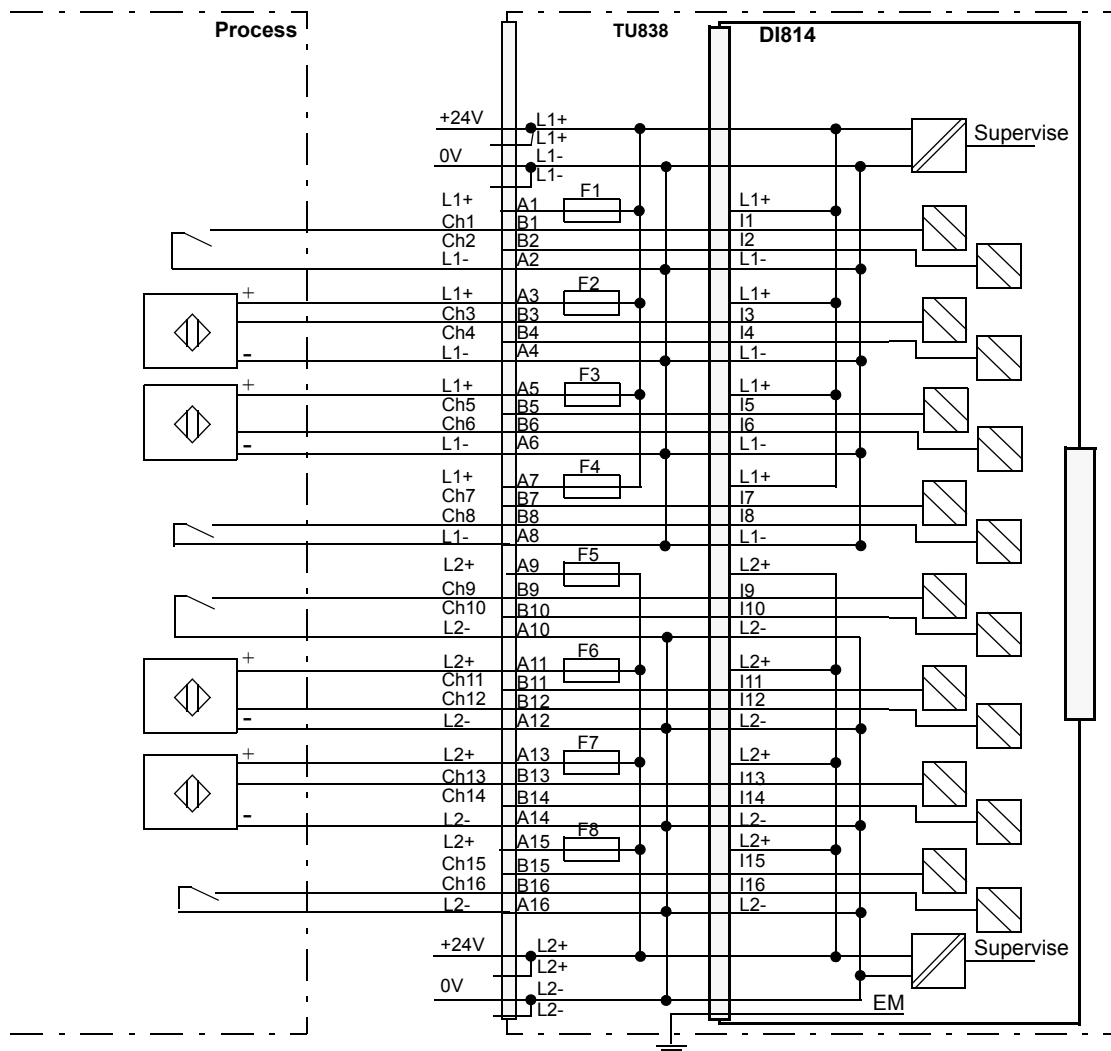


Figure 111. DI814 with TU838 Extended MTU Process Connections

Figure 112 shows the process connections for the DI814 when installed on a TU810 or TU814 Compact MTU.

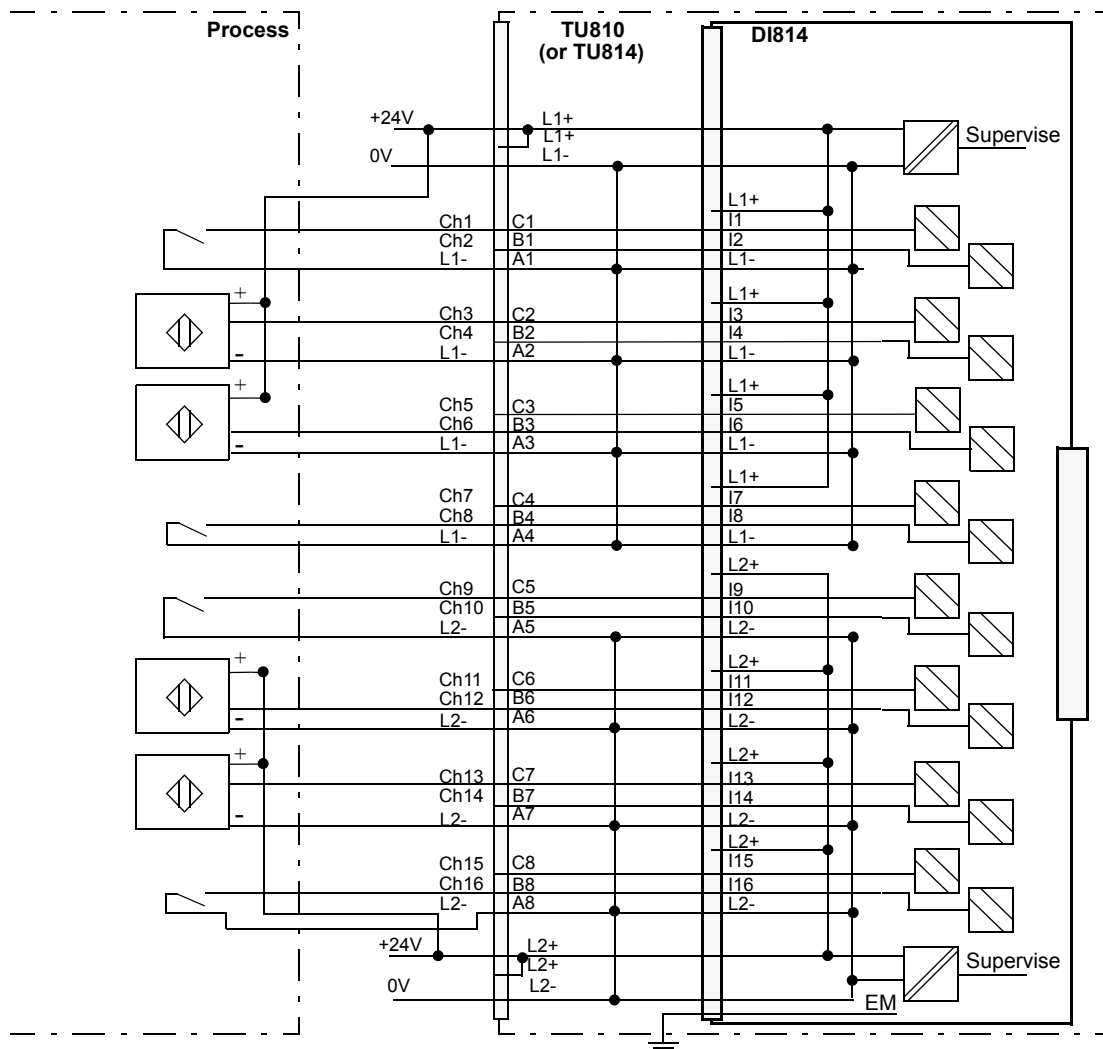


Figure 112. DI814 with TU810 or TU814 Compact MTU Process Connections

Figure 113 shows the process connections for the DI814 when installed on a TU812 Compact MTU.

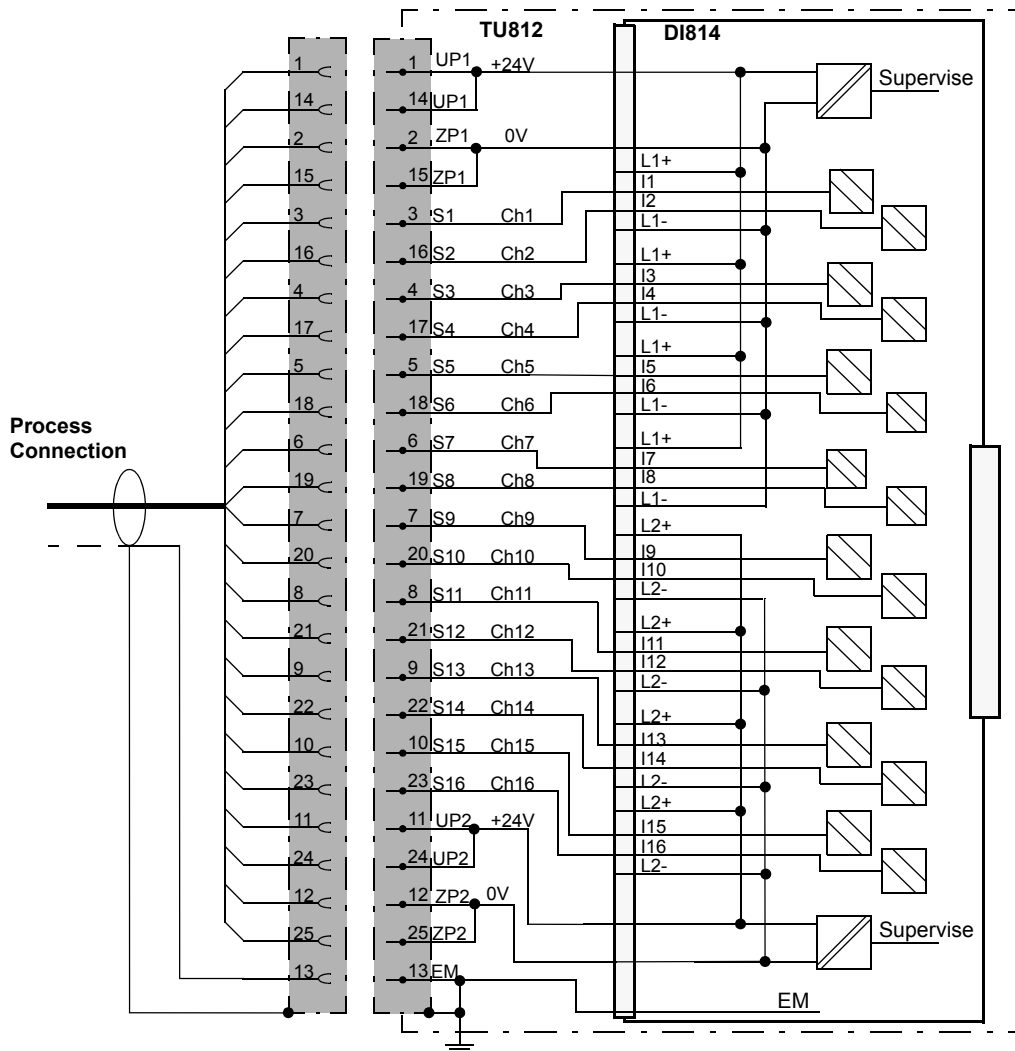


Figure 113. DI814 with TU812 Compact MTU Process Connections

## DI818 Digital Input Module, 24 v, Current Sinking

### Features

- 32 channels for 24 V d.c. inputs with current sinking.
- Two Isolated groups of 16 channels with voltage supervision.
- Voltage Supervision
- Signal Filtering

### Description

The DI818 is a 32 channel 24 V digital input module for the S800 I/O. This module has 32 digital inputs. The input voltage range is 18 to 30 volt d.c. and the input current is 4.3mA at 24 V. The inputs are divided into two individually isolated groups with 16 channels and one voltage supervision input in each group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

If voltage supervision is enabled, channels 1-16 and 17-32 will indicate channel error if the process voltage for its channel group fails.

The detection time for this supervision is 70 ms.

The I/O signals are connected to the MTU with the process connector. Three different types of MTUs can be used. The extended MTU (TU830) and the compact MTU (TU818) provides 1-wire connection to the sensors. The compact MTU (TU819) has two D-sub 25 pin connectors for interfacing with the process.

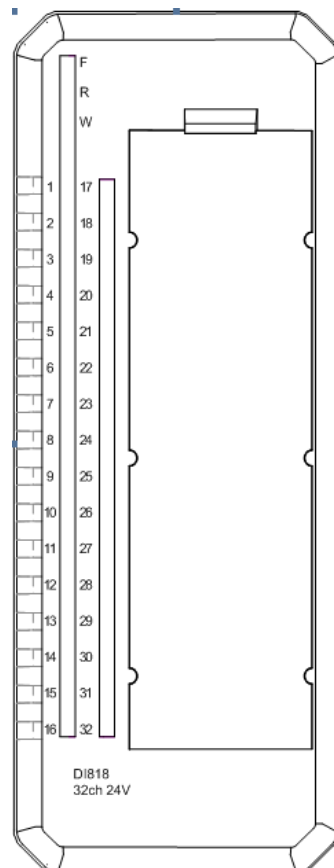




Table 55. DI818 Digital Input Module Specifications

Feature	DI818 Digital Input Module
Number of channels	32 (2 x 16), current sinking
Rated voltage (process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	+11 to +30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	4,3 mA @ 24 V d.c.
Input Current "1"	>3.2 mA
Input Current "0"	<2.6 mA
Input Impedance	5.6 kΩ @ 24 V d.c.
Maximum field cable length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	2 channels (1 per group)
Current consumption 5 V (Modulebus)	70 mA
Power dissipation <sup>(1)</sup>	3.1 W
Current consumption 24 V (process power supply, UPx)	25mA
Isolation	Groupwise isolated (RIV 50V) from ground
Module termination units	TU830, TU818, TU819
MTU keying code	EA
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

- (1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volts.

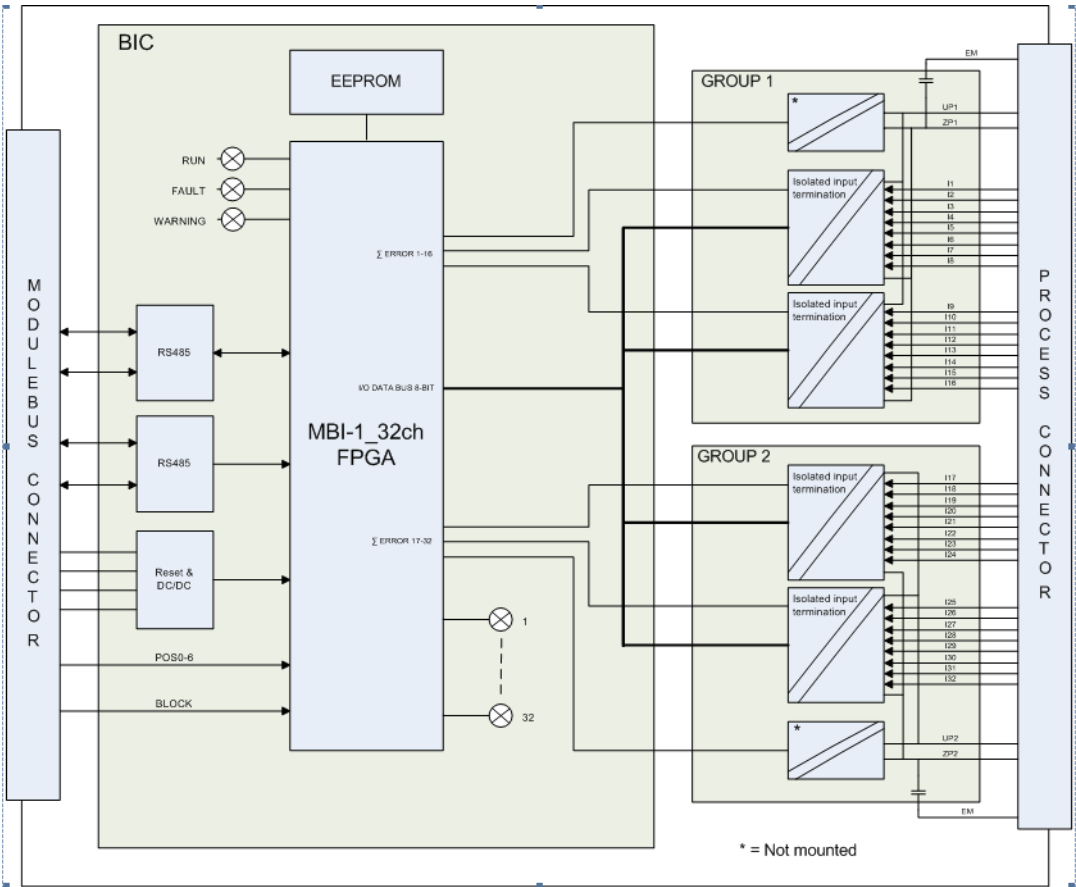


Figure 114. DI818 Block Diagram

**Process Interface***Table 56. Process Connector Pinning*

<b>Process Connection</b>	<b>TU830</b>	<b>TU818</b>	<b>TU819</b>
24 V dc	L1 + (2)	L1 + (2)	1, 14, 11, 24 (X1a)
0 V dc	L1 - (2)	L1- (2)	2, 15, 12, 25 (X1a)
Ch 1 Input	C1	D1	3 (X1a)
Ch 2 Input	B1	C1	16 (X1a)
Ch 1/Ch 2, L1- /L2-	A1	-	-
Ch 3 Input	C2	B1	4 (X1a)
Ch 4 Input	B2	A1	17 (X1a)
Ch 3/Ch 4, L1- /L2-	A2	-	-
Ch 5 Input	C3	D2	5 (X1a)
Ch 6 Input	B3	C2	18 (X1a)
Ch 5/Ch 6, L1- /L2-	A3	-	-
Ch 7 Input	C4	B2	6 (X1a)
Ch 8 Input	B4	A2	19 (X1a)
Ch 7/Ch 8, L1- /L2-	A4	-	-
Ch 9 Input	C5	D3	7 (X1a)
Ch 10 Input	B5	C3	20 (X1a)
Ch 9/Ch 10, L1- /L2-	A5	-	-

Table 56. Process Connector Pinning (Continued)

Process Connection	TU830	TU818	TU819
Ch 11 Input	C6	B3	8 (X1a)
Ch 12 Input	B6	A3	21 (X1a)
Ch 11/Ch 12, L1-/L2-	A6	-	-
Ch 13 Input	C7	D4	9 (X1a)
Ch 14 Input	B7	C4	22 (X1a)
Ch 13/Ch 14, L1-/L2-	A7	-	-
Ch 15 Input	C8	B4	10 (X1a)
Ch 16 Input	B8	A4	23 (X1a)
Ch 15/Ch 16, L1-/L2-	A8	-	-
Ch 17 Input	C9	D5	3 (X1b)
Ch 18 Input	B9	C5	16 (X1b)
Ch 17/Ch 18, L2-	A9	-	-
Ch 19 Input	C10	B5	4 (X1b)
Ch 20 Input	B10	A5	17 (X1b)
Ch 19/Ch 20, L2-	A10	-	-
Ch 21 Input	C11	D6	5 (X1b)
Ch 22 Input	B11	C6	18 (X1b)
Ch 21/Ch 22, L2-	A11	-	-
Ch 23 Input	C12	B6	6 (X1b)
Ch 24 Input	B12	A6	19 (X1b)

Table 56. Process Connector Pinning (Continued)

Process Connection	TU830	TU818	TU819
Ch 23/Ch 24, L2-	A12	-	-
Ch 25 Input	C13	D7	7 (X1b)
Ch 26 Input	B13	C7	20 (X1b)
Ch 25/Ch 26, L2-	A13	-	-
Ch 27 Input	C14	B7	8 (X1b)
Ch 28 Input	B14	A7	21 (X1b)
Ch 27/Ch 28, L2-	A14	-	-
Ch 29 Input	C15	D8	9 (X1b)
Ch 30 Input	B15	C8	22 (X1b)
Ch 29/Ch 30, L2-	A15	-	-
Ch 31 Input	C16	B8	10 (X1b)
Ch 32 Input	B16	A8	23 (X1b)
Ch 31/Ch 32, L2-	A16	-	-
+24 V d.c.	L2+ (2)	L2+ (2)	1, 14, 11, 24 (X1b)
0 V d.c.	L2- (2)	L2- (2)	2, 15, 12, 25 (X1b)

**a** Pin 13 connected to connector body for EM.

Field connection example with TU830 Extended Module Termination Unit is shown in [Figure 115](#).

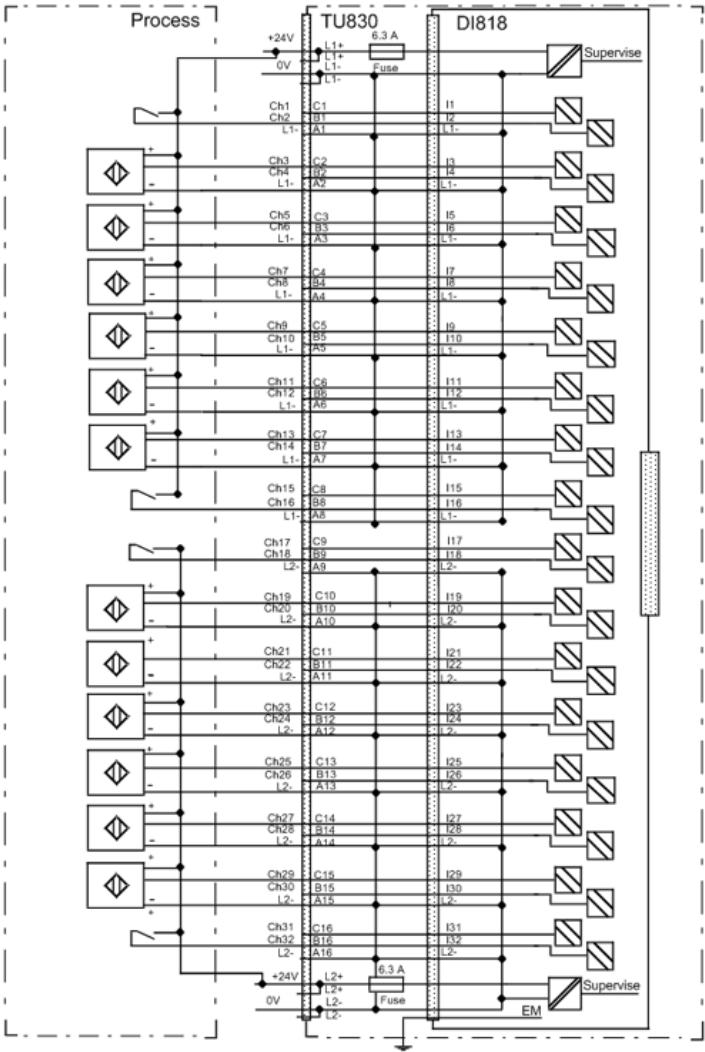


Figure 115. Field connection example with TU830 Extended Module Termination Unit.

Field connection example with TU818 Compact Module Termination Unit is shown in [Figure 116](#).

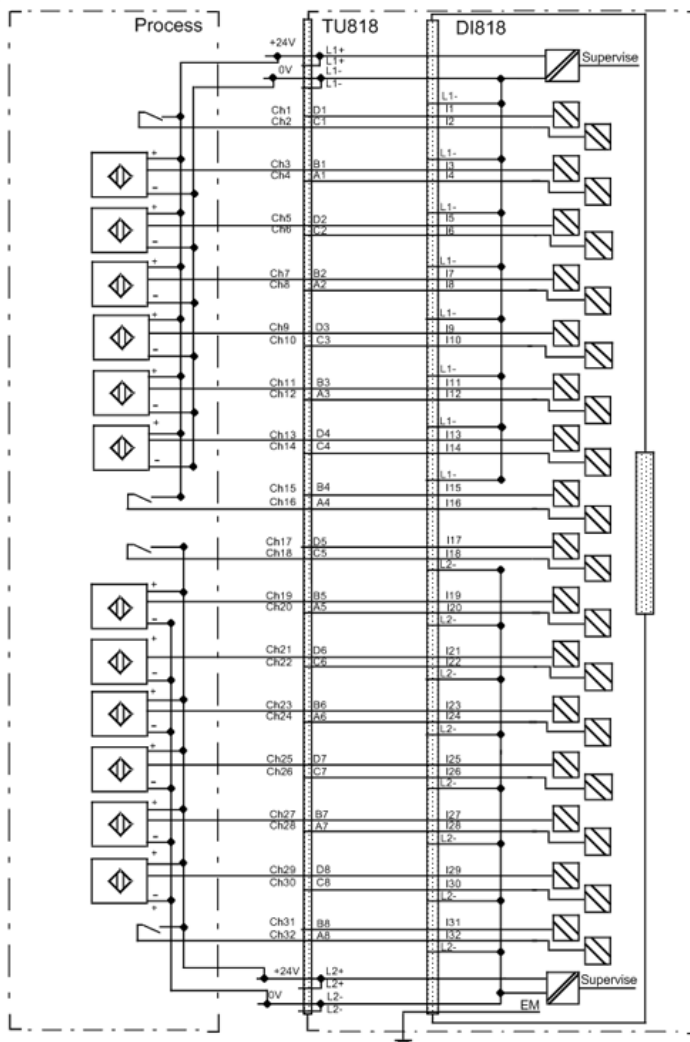


Figure 116. Field connection example with TU818 Compact Module Termination Unit





## DI820 Digital Input Module, 120 V a.c./d.c

### Features

- 8 channels for 120 V a.c./d.c. inputs.
- Individually isolated channels.
- Voltage supervision of field input power.
- Input status indicators.
- Signal filtering.

### Description

The DI820 is an 8 channel 120 V a.c./d.c. digital input module for the S800 I/O. This module has 8 digital inputs. The a.c. input voltage range is 77 - 130 volt and the input current is 10 mA at 120 V a.c. The d.c. input range is 75 - 145 V and the input current is 2.8 mA at 110 V. The inputs are individually isolated.

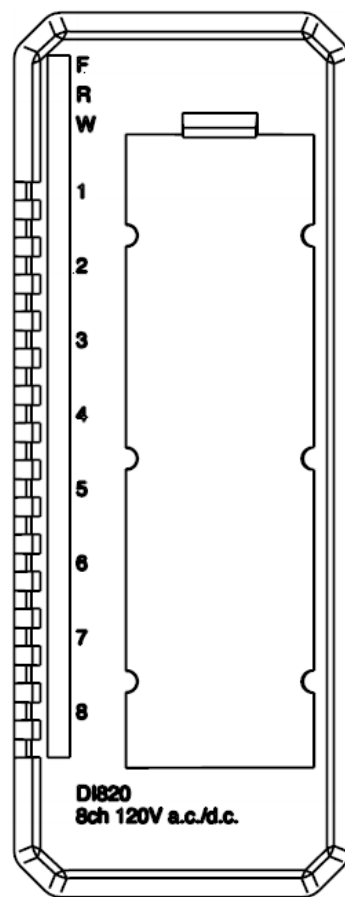
Every input channel consists of current limiting components, EMC protection components, input state indication LED, optical isolation barrier and an analog filter (6 ms).

Channel 1 can be used as process voltage supervision input for channels 2-4 and channel 8 can be used as process voltage supervision input for channels 5-7.

If process voltage supervision is enabled, channels 2-4 and 5-7 will indicate channel error unless a high level voltage is applied on channels 1 and 8 respectively.

The detection time for this supervision is 70 ms.

If process voltage supervision is disabled channels 1 and 8 can be used as normal input channels.



The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

Five different types of MTUs can be used. The TU831/TU851 Extended MTU, TU811/TU811V1 Compact MTU, and TU813 Compact MTU provide two terminals per channel.

The TU839 Extended MTU provides two terminals per channel and one terminal for the outgoing sensor supply.

### Technical Data

Table 57. DI820 Digital Input Module Specifications

Feature	DI820 Digital Input Module
Number of channels	8
Rated voltage (process power supply range)	120 V a.c. (77 to 130 V a.c.) 110 V d.c. (75 to 145 V d.c.)
Input voltage range, "1"	77 to 130 V ±75 to 145 V d.c.
Input voltage range, "0"	0 to 30 V a.c. ±0 to 20 V d.c.
Nominal input channel current	10 mA ac @ 120 V a.c. 2.8 mA dc @ 110 V d.c.
Input frequency range a.c.	47...63 Hz
Impedance	12 kΩ (a.c.) 39 KΩ (d.c.)
Maximum Field Cable Length	200 meters (219 yd.) 100pF/m. for a.c. 600 meters (656 yd.) for d.c.

*Table 57. DI820 Digital Input Module Specifications (Continued)*

Feature	DI820 Digital Input Module
Filter times (digital, selectable)	2, 4, 8, 16 ms
Analog filter On/Off delay	5/18 ms
Process voltage supervision	2 channels, 1 and 8
Current consumption 5 V (Modulebus)	50 mA
Power dissipation <sup>(1)</sup>	2.8 W
Isolation	Individually isolated channels
Module termination units	TU811/TU811V1, TU813, TU831, TU839 or TU851
MTU keying code	AB
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated.

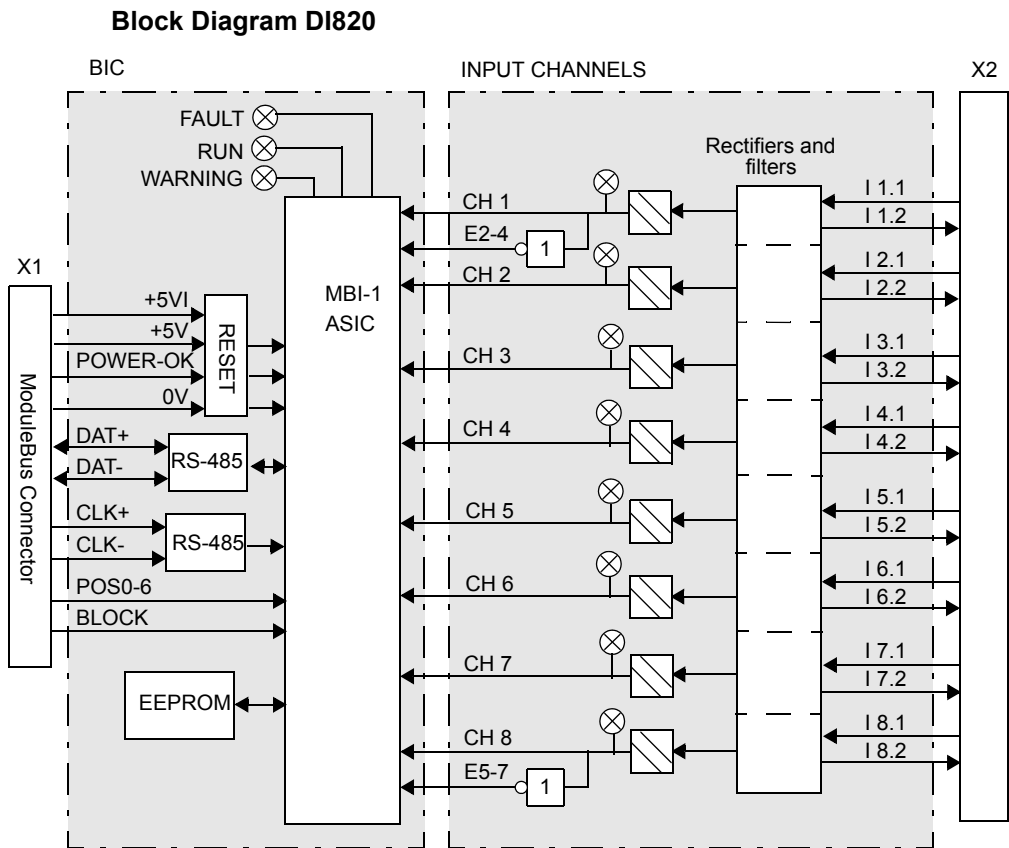


Figure 118. DI820 Block Diagram

**Process Connections***Table 58. DI820 Process Connections*

<b>Process Connection</b>	<b>TU811/TU813 Terminal</b>	<b>TU831 Terminal</b>	<b>TU839 Terminal</b>	<b>TU851 Terminal</b>
UP1	-	-	L1 (2)	-
Ch 1.1 Input	B1	B1	C1	B2
Ch 1.2 Input	A1	A1	A1	A2
Ch 1, U1	-	-	B1	-
Ch 2.1 Input	C2	B2	C2	B4
Ch 2.2 Input	A2	A2	A2	A4
Ch 2, U1	-	-	B2	-
Ch 3.1 Input	B3	B3	C3	B6
Ch 3.2 Input	A3	A3	A3	A6
Ch 3, U1	-	-	B3	-
Ch 4.1 Input	C4	B4	C4	B8
Ch 4.2 Input	A4	A4	A4	A8
Ch 4, U1	-	-	B4	-
Ch 5.1 Input	B5	B5	C5	B10
Ch 5.2 Input	A5	A5	A5	A10
Ch 5, U2	-	-	B5	-
Ch 6.1 Input	C6	B6	C6	B12
Ch 6.2 Input	A6	A6	A6	A12
Ch 6, U2	-	-	B6	-
Ch 7.1 Input	B7	B7	C7	B14
Ch 7.2 Input	A7	A7	A7	A14

Table 58. DI820 Process Connections (Continued)

Process Connection	TU811/TU813 Terminal	TU831 Terminal	TU839 Terminal	TU851 Terminal
Ch 7, U2	-	-	B7	-
Ch 8.1 Input	C8	B8	C8	B16
Ch 8.2 Input	A8	A8	A8	A16
Ch 8, U2	-	-	B8	-
UP2	-	-	L2 (2)	-

Figure 119 shows the process connections for the Digital Input Module DI820 when installed on a TU831 Extended MTU.

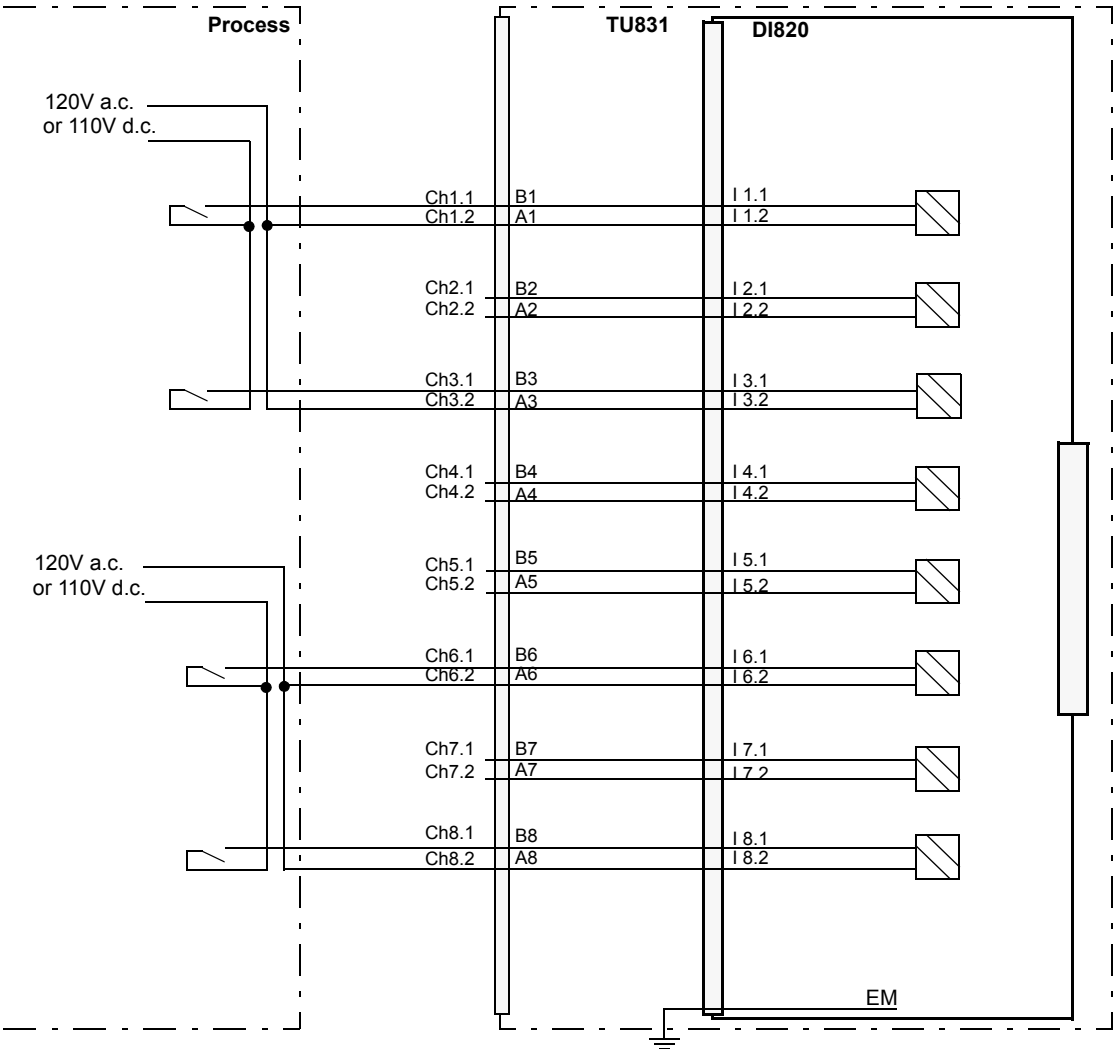


Figure 119. DI820 with TU831 Extended MTU Process Connections

Figure 120 shows the process connections for the DI820 when installed on a TU811/TU811V1 or TU813 Compact MTU.

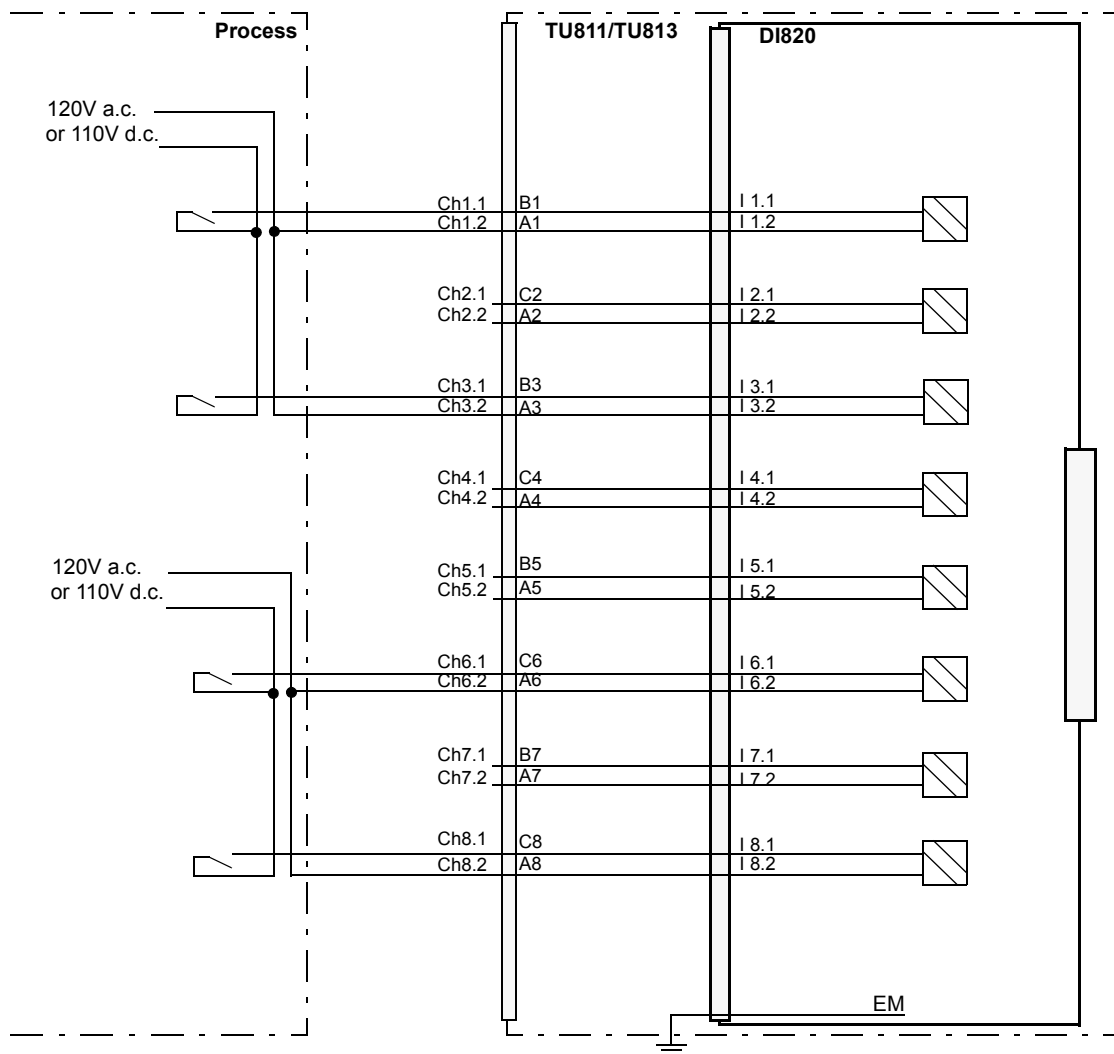


Figure 120. DI820 with TU811 or TU813 Compact MTU Process Connections



Figure 121 shows the process connections for the DI820 when installed on a TU839 Extended MTU.

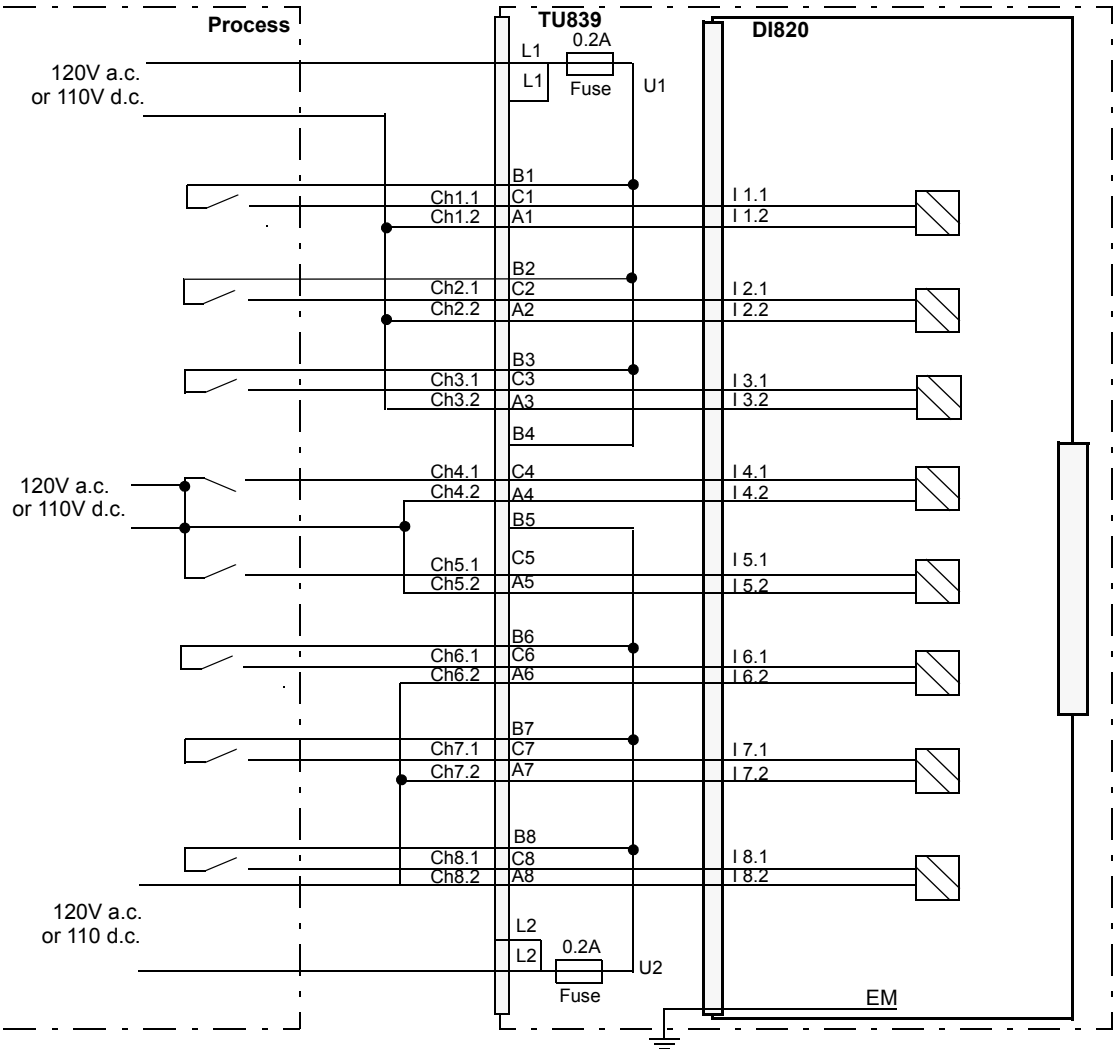


Figure 121. DI820 with TU839 Extended MTU Process Connections

Figure 122 shows the process connections for the DI820 when installed on a TU851 Extended MTU.

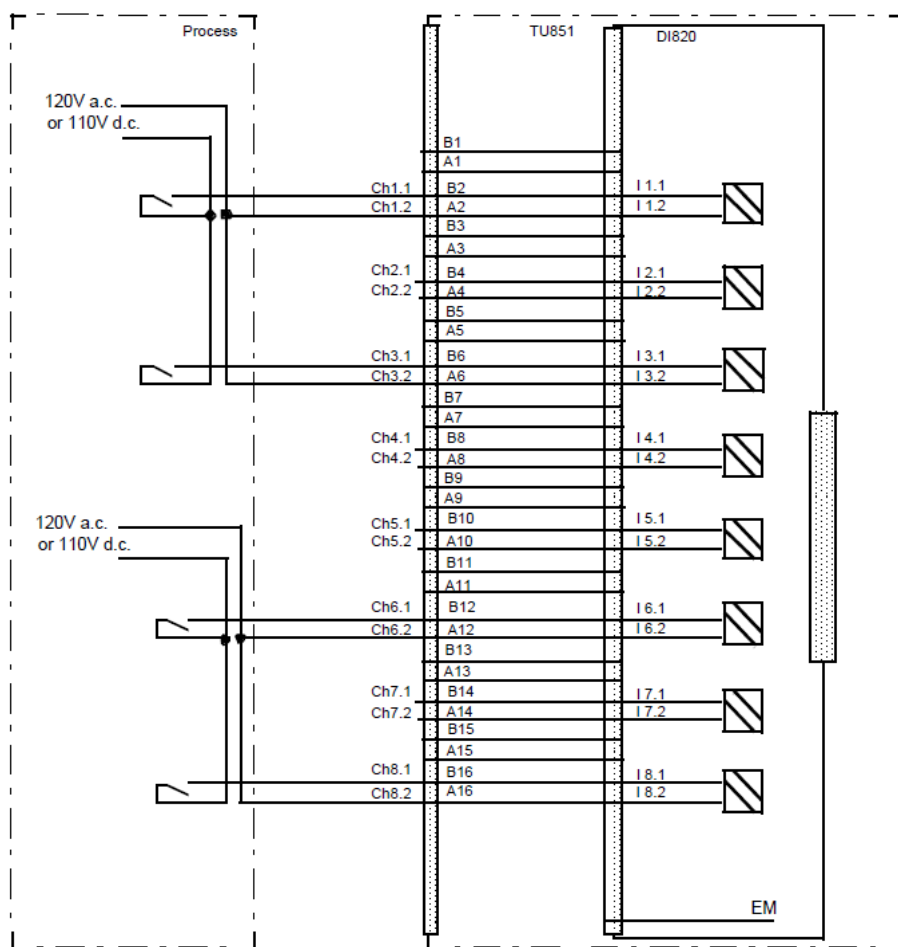


Figure 122. DI820 with TU851 Extended MTU Process Connections

## DI821 Digital Input Module, 230 V a.c./d.c.

### Features

- 8 channels for 230 V a.c./d.c. inputs.
- Individually isolated points.
- Voltage supervision of field input power.
- Input status indicators.
- Signal filtering.

### Description

The DI821 is a 8 channel, 230 V a.c./d.c, digital input module for the S800 I/O. This module has 8 digital inputs.

The ac input voltage range is 164 to 264 V and the input current is 11 mA at 230 V a.c. The d.c. input voltage range is 175 to 275 volt and the input current is 1.6 mA at 220 V d.c. The inputs are individually isolated.

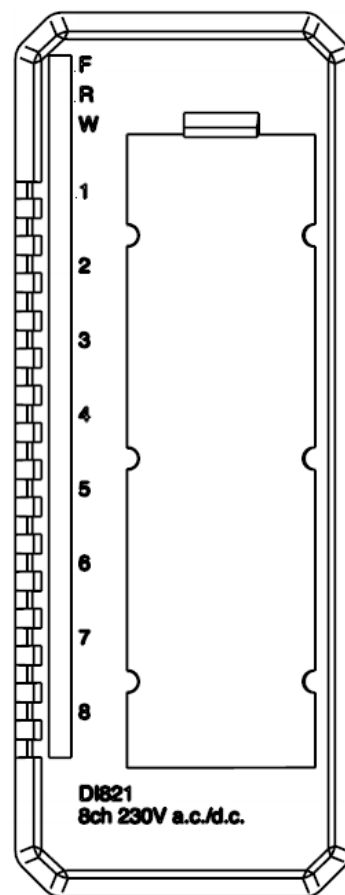
Every input channel consists of current limiting components, EMC protection components, input state indication LED, optical isolation barrier and an analog filter (6 ms).

Channel 1 can be used as process voltage supervision input for channels 2-4 and channel 8 can be used as process voltage supervision input for channels 5-7.

If process voltage supervision is enabled, channels 2-4 and 5-7 will indicate channel error unless a high level voltage is applied on channels 1 and 8 respectively.

The detection time for this supervision is 70 ms.

If process voltage supervision is disabled channels 1 and 8 can be used as normal input channels.



The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

Five different types of MTUs can be used. The TU831/TU851 Extended MTU, TU811 Compact MTU, and TU813 Compact MTU provide two terminals per channel.

The TU839 Extended MTU provides two terminals per channel and one terminal for the outgoing sensor supply.

### Technical Data

Table 59. DI821 Digital Input Module Specifications

Feature	DI821 Digital Input Module
Number of channels	8
Rated voltage (process power supply range)	230 V a.c. (164 to 264 V a.c.) 220 V d.c. (175 to 275 V d.c.)
Input voltage range, "1"	164 to 264 V a.c. ±175 to 275 V d.c.
Input voltage range, "0"	0 to 50 V a.c. ±0 to 40 V d.c.
Nominal input channel current	11 mA @ 230 V a.c. 1.6mA @ 220 V d.c.
Input frequency range, a.c.	47...63 Hz
Impedance	21 kΩ (a.c.) 134 KΩ (d.c.)
Maximum field cable length	200 meters (219 yd.) 100pF/m for a.c. 600 meters (656 yd.) for d.c.
Filter times (digital, selectable)	2, 4, 8, 16 ms

*Table 59. DI821 Digital Input Module Specifications (Continued)*

<b>Feature</b>	<b>DI821 Digital Input Module</b>
Analog filter On/Off delay	5/28 ms
Process voltage supervision	2 channels, 1 and 8
Current consumption 5 V (Modulebus)	50 mA
Power dissipation <sup>(1)</sup>	2.8 W
Isolation	Individually isolated channels
Module termination units	TU811, TU813, TU831, TU839, and TU851
MTU keying code	AC
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated.

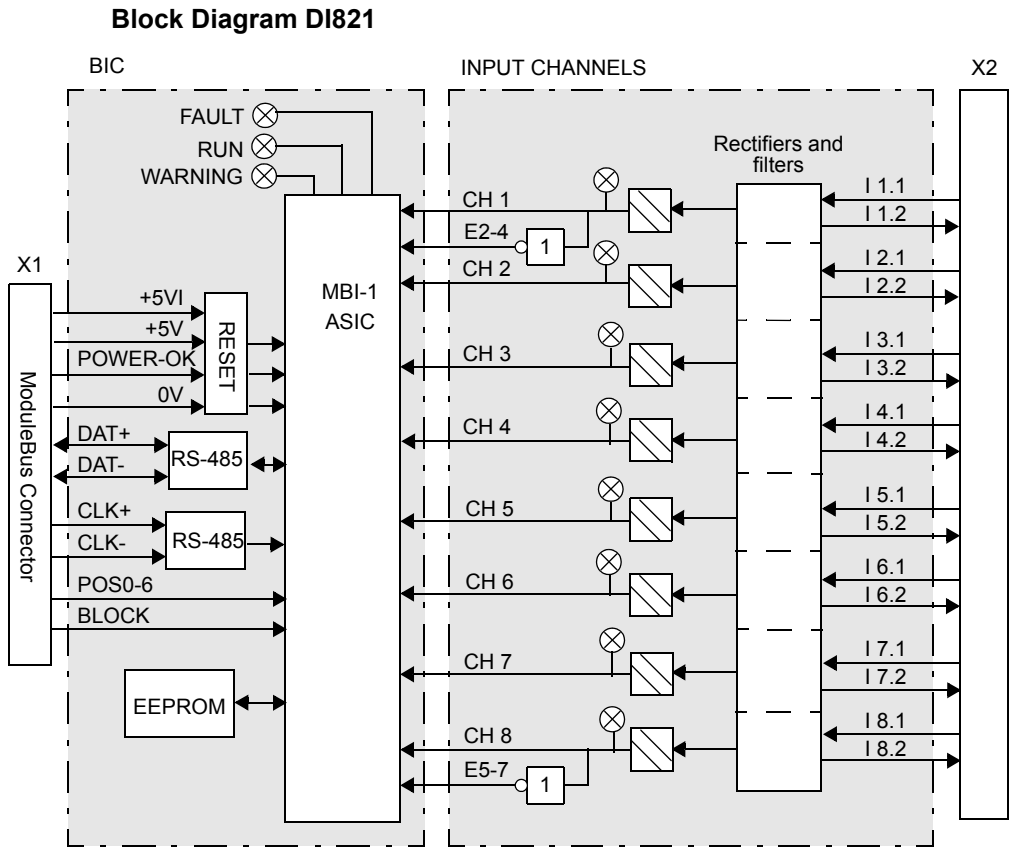


Figure 123. DI821 Block Diagram

**Process Connections***Table 60. DI821 Process Connections*

<b>Process Connection</b>	<b>TU811/TU813 Terminal</b>	<b>TU831 Terminal</b>	<b>TU839 Terminal</b>	<b>TU851 Terminal</b>
UP1	-	-	L1 (2)	-
Ch 1.1 Input	B1	B1	C1	B2
Ch 1.2 Input	A1	A1	A1	A2
Ch 1, U1	-	-	B1	-
Ch 2.1 Input	C2	B2	C2	B4
Ch 2.2 Input	A2	A2	A2	A4
Ch 2, U1	-	-	B2	-
Ch 3.1 Input	B3	B3	C3	B6
Ch 3.2 Input	A3	A3	A3	A6
Ch 3, U1	-	-	B3	-
Ch 4.1 Input	C4	B4	C4	B8
Ch 4.2 Input	A4	A4	A4	A8
Ch 4, U1	-	-	B4	-
Ch 5.1 Input	B5	B5	C5	B10
Ch 5.2 Input	A5	A5	A5	A10
Ch 5, U2	-	-	B5	-
Ch 6.1 Input	C6	B6	C6	B12
Ch 6.2 Input	A6	A6	A6	A12
Ch 6, U2	-	-	B6	-
Ch 7.1 Input	B7	B7	C7	B14
Ch 7.2 Input	A7	A7	A7	A14

Table 60. DI821 Process Connections (Continued)

Process Connection	TU811/TU813 Terminal	TU831 Terminal	TU839 Terminal	TU851 Terminal
Ch 7, U2	-	-	B7	-
Ch 8.1 Input	C8	B8	C8	B16
Ch 8.2 Input	A8	A8	A8	A16
Ch 8, U2	-	-	B8	-
UP2	-	-	L2 (2)	-



Figure 124 shows the process connections for the Digital Input Module DI821 when installed on a TU831 Extended MTU.

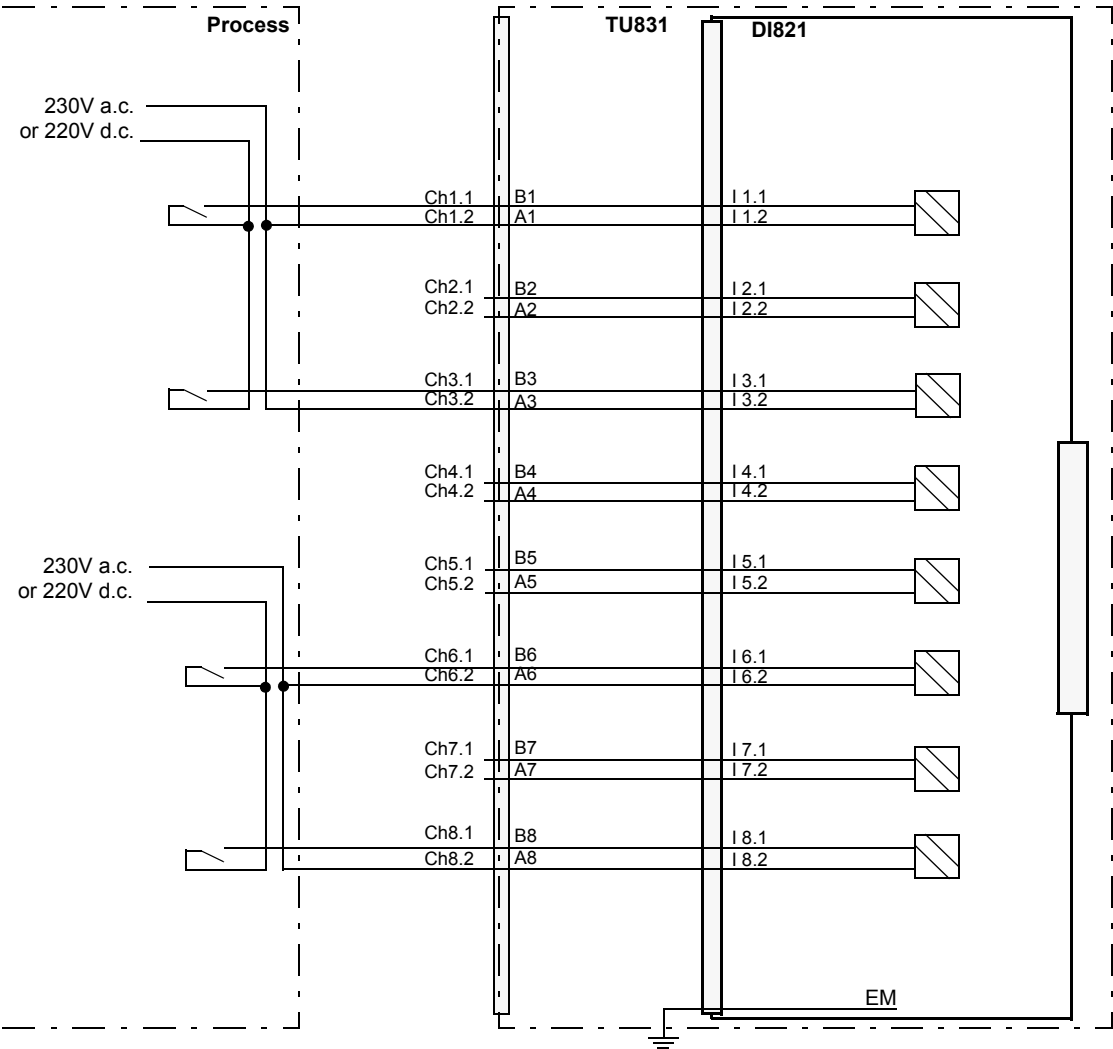


Figure 124. DI821 with TU831 Extended MTU Process Connections

Figure 125 shows the process connections for the DI821 when installed on a TU811 or TU813 Compact MTU.

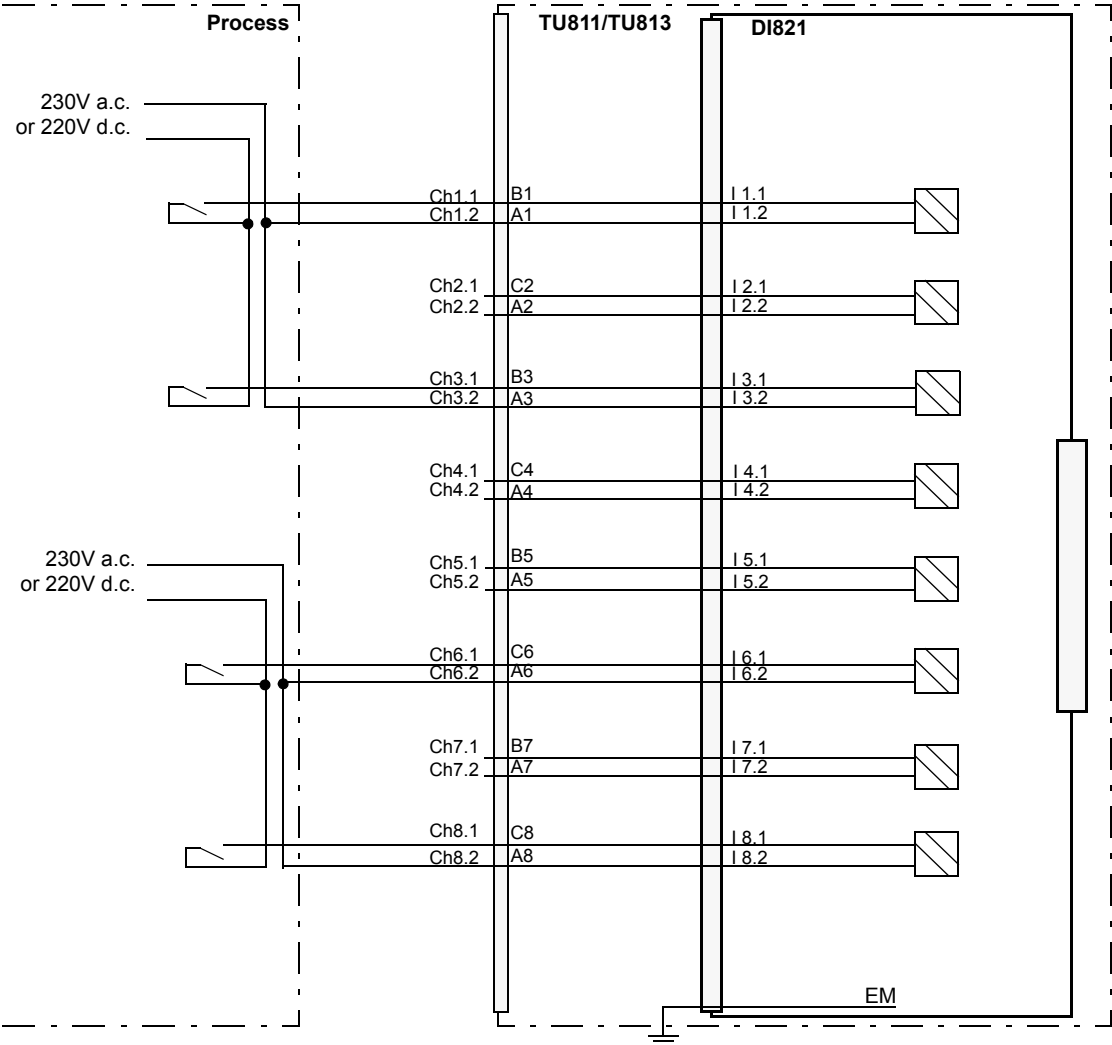


Figure 125. DI821 with TU811 or TU813 Compact MTU Process Connections

Figure 126 shows the process connections for the DI821 when installed on a TU839 Extended MTU.

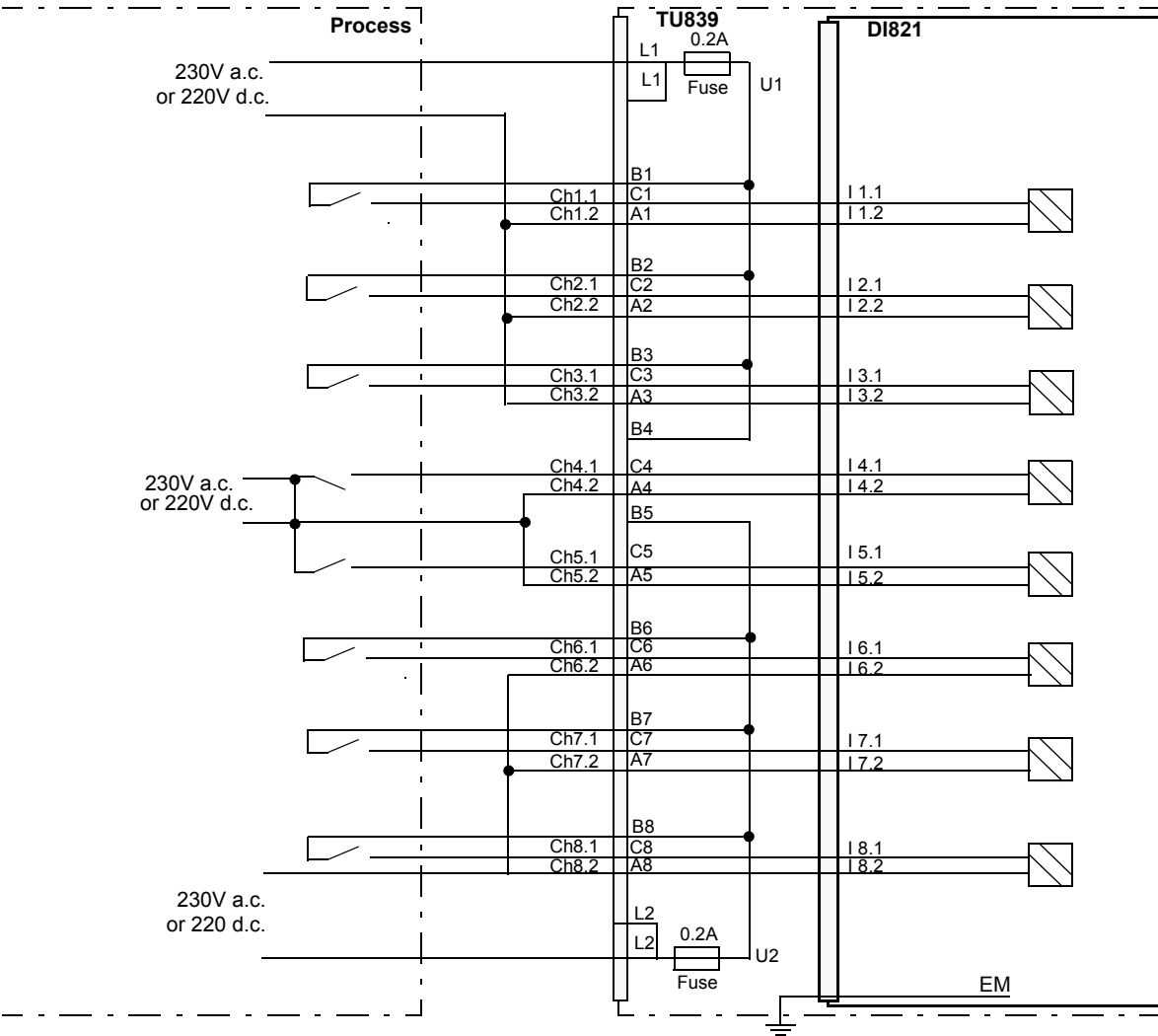


Figure 126. DI821 with TU839 Extended MTU Process Connections

Figure 127 shows the process connections for the DI821 when installed on a TU851 Extended MTU.

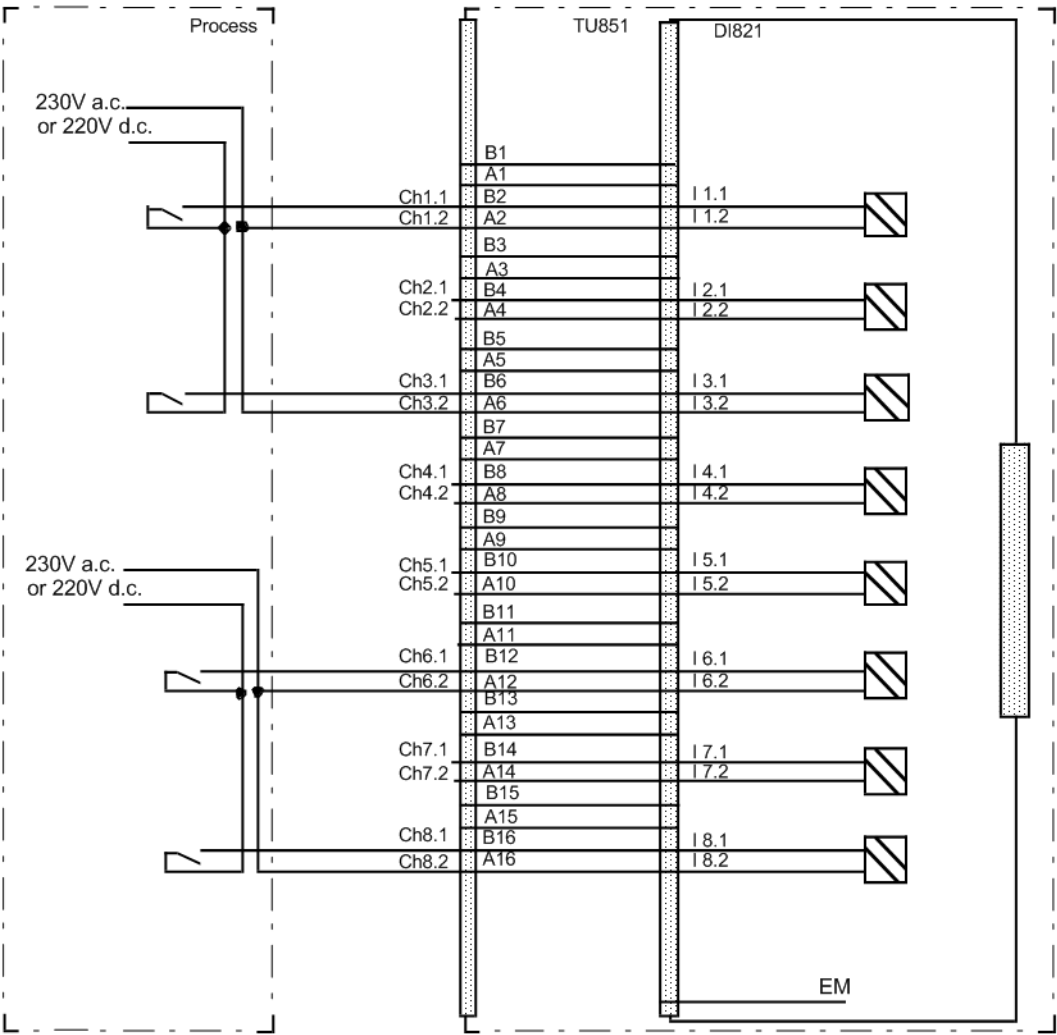


Figure 127. DI821 with TU851 Extended MTU Process Connections

## DI825 Digital Input Module, 125 V d.c with SOE

### Features

- 8 channels for 125 V d.c. inputs.
- Individually isolated channels.
- Input status indicators.
- Sequence of event (SOE) functionality.
- Signal filtering.

### Description

The DI825 is an 8 channel 125 V d.c. digital input module for the S800 I/O. The input range is 71 - 150 V and the input current is 3.0 mA at 125 V. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED, optical isolation barrier.

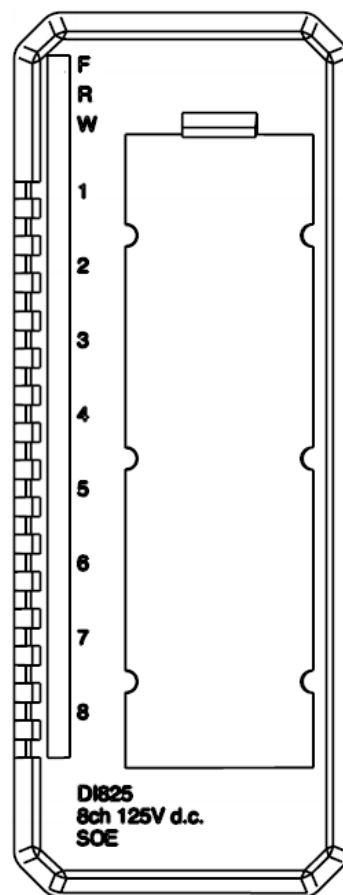
Channel 1 can be used as process voltage supervision input for channels 2-4 and channel 8 can be used as process voltage supervision input for channels 5-7.

If process voltage supervision is enabled, channels 2-4 and 5-7 will indicate channel error unless a high level voltage is applied on channels 1 and 8 respectively.

The detection time for this supervision is 70 ms.

If process voltage supervision is disabled channels 1 and 8 can be used as normal input channels.

The input channels can be digitally filtered. The filter times can be set in the range 0 to 100 ms. This means that noise pulses shorter than the filter time are filtered out and pulses longer than the filter time get through the filter.



Five different types of MTUs can be used. The TU831 Extended MTU, TU811 Compact MTU, and TU813 Compact MTU provide two terminals per channel. The TU839 Extended MTU provides two terminals per channel and one terminal for the outgoing sensor supply.

### **Event Recording**

The DI825 Input Module can be used for event recording (SOE), that is, changing signals at digital input channels can be announced together with a time stamp indicating when it occurred. Events are generated on both positive and negative going edges of the signals. The time stamp has a resolution of 0.4 millisecond, and is compensated for the filter time.

The module has intermediate storage for 32 events.

The SOE functionality can be switched on and off per channel.

For all channels with enabled SOE capability, a shutter filter is implemented that prevents intermediate storage for events from overflow. The shutter filter is closed as soon as the number of events generated within the shutter period (0-255 seconds) exceeds the shutter trigger number (0-255 changes). The shutter filter remains closed as long as the recovery time (0-65535 seconds) has not expired.

### **Simple Digital Input**

If no event recording is used, the DI825 acts like a simple digital input device.

**Technical Data***Table 61. DI825 Digital Input Module Specifications*

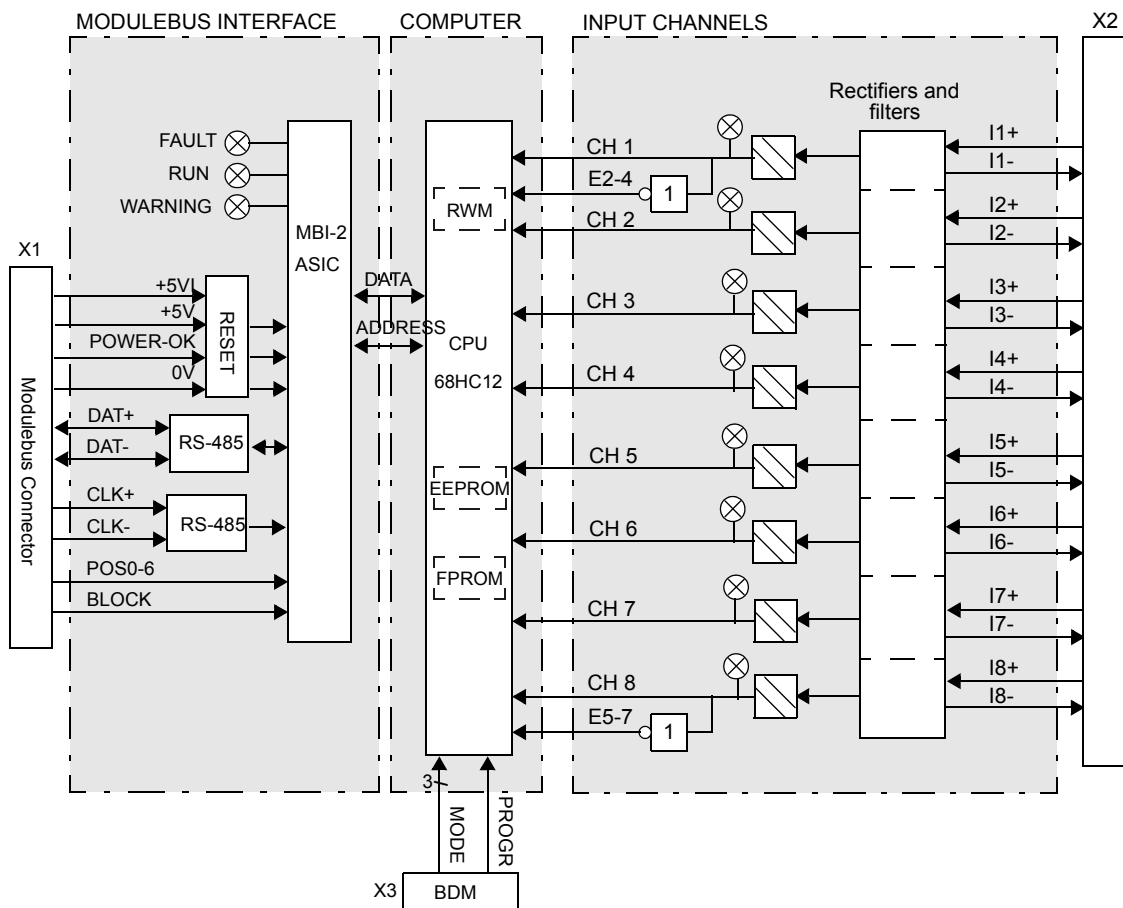
<b>Feature</b>	<b>DI825 Digital Input Module</b>
Number of channels	8
Rated voltage	125 V d.c.
Input voltage range, “1”	71 to 156 V
Input voltage range, “0”	0 to 20 V
Nominal input channel current	3.0 mA @ 125 V
Input current, “1”	$\geq 1.4$ mA
Input current, “0”	$\leq 0.3$ mA
Nominal impedance	41.5 k $\Omega$
Maximum Field Cable Length	600 meters (656 yd.)
Filter times (digital, selectable)	0 to 100 ms
Process voltage supervision	2 channels, 1 and 8
Shutter filter	
Shutter period	0 - 255 s
Shutter trigger number	0 - 255 changes
Recovery time	0 - 65535 s
Intermediate storage	32 events
Event recording resolution	0.4 ms
Error time stamp	-0.25 ms to 1 ms
Current consumption 5 V (Modulebus)	Max 90 mA
Max power dissipation	4.9 W <sup>(1)</sup>
Isolation	Individually isolated channels

Table 61. DI825 Digital Input Module Specifications (Continued)

Feature	DI825 Digital Input Module
Dielectric test voltage	2300 V a.c. Ch - EM 1350 V a.c. Ch - Ch
Module termination units	TU811, TU813, TU831, or TU839 and TU851
MTU keying code	AB
Rated insulation voltage	250 V

(1) All inputs activated



**Block Diagram DI825***Figure 128. DI825 Block Diagram*

**Process Connections***Table 62. DI825 Process Connections*

<b>Process Connection</b>	<b>TU811/TU813 Terminal</b>	<b>TU831 Terminal</b>	<b>TU839 Terminal</b>	<b>TU851 Terminal</b>
UP1	-	-	L1 (2)	-
Ch 1.1 Input	B1	B1	C1	B2
Ch 1.2 Input	A1	A1	A1	A2
Ch 1, U1	-	-	B1	-
Ch 2.1 Input	C2	B2	C2	B4
Ch 2.2 Input	A2	A2	A2	A4
Ch 2, U1	-	-	B2	-
Ch 3.1 Input	B3	B3	C3	B6
Ch 3.2 Input	A3	A3	A3	A6
Ch 3, U1	-	-	B3	-
Ch 4.1 Input	C4	B4	C4	B8
Ch 4.2 Input	A4	A4	A4	A8
Ch 4, U1	-	-	B4	-
Ch 5.1 Input	B5	B5	C5	B10
Ch 5.2 Input	A5	A5	A5	A10
Ch 5, U2	-	-	B5	-
Ch 6.1 Input	C6	B6	C6	B12
Ch 6.2 Input	A6	A6	A6	A12
Ch 6, U2	-	-	B6	-
Ch 7.1 Input	B7	B7	C7	B14
Ch 7.2 Input	A7	A7	A7	A14

*Table 62. DI825 Process Connections (Continued)*

<b>Process Connection</b>	<b>TU811/TU813 Terminal</b>	<b>TU831 Terminal</b>	<b>TU839 Terminal</b>	<b>TU851 Terminal</b>
Ch 7, U2	-	-	B7	-
Ch 8.1 Input	C8	B8	C8	B16
Ch 8.2 Input	A8	A8	A8	A16
Ch 8, U2	-	-	B8	-
UP2	-	-	L2 (2)	-

Figure 129 shows the process connections for the Digital Input Module DI825 when installed on a TU811 or TU813 Compact MTU.

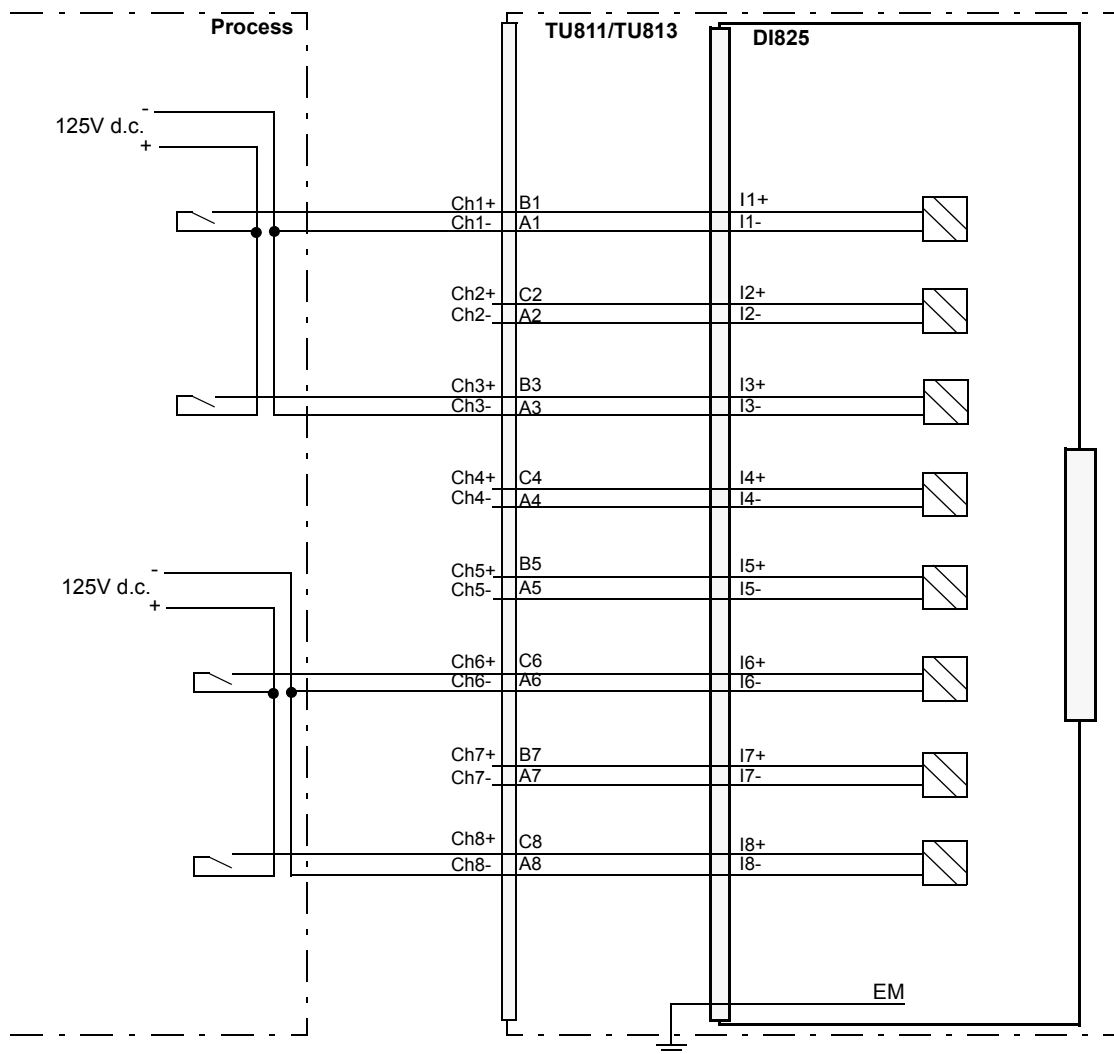


Figure 129. DI825 with TU811 or TU813 Compact MTU Process Connections

Figure 130 shows the process connections for the DI825 when installed on a TU831 Extended MTU.

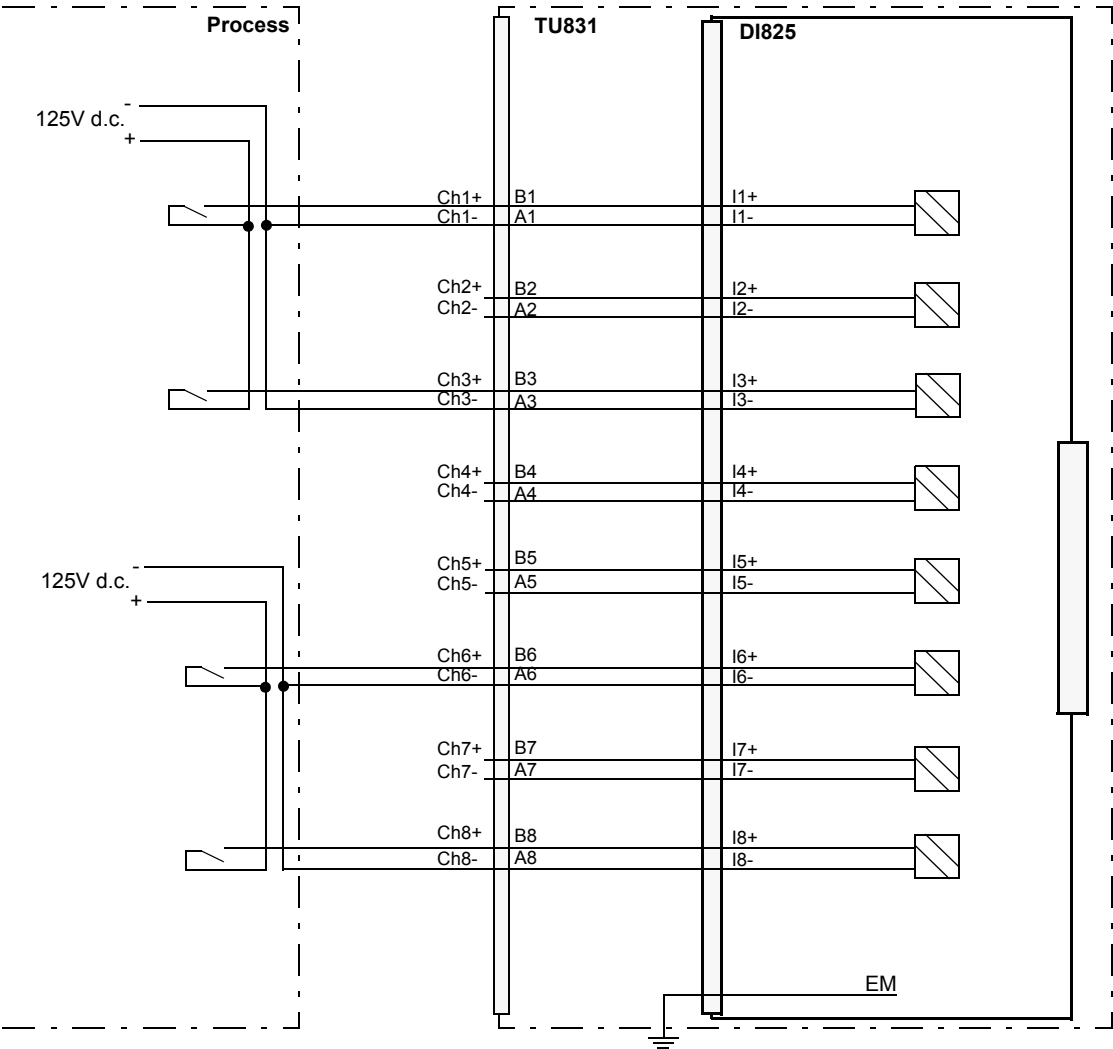


Figure 130. DI825 with TU831 Extended MTU Process Connections

Figure 131 shows the process connections for the DI825 when installed on a TU839 Extended MTU.

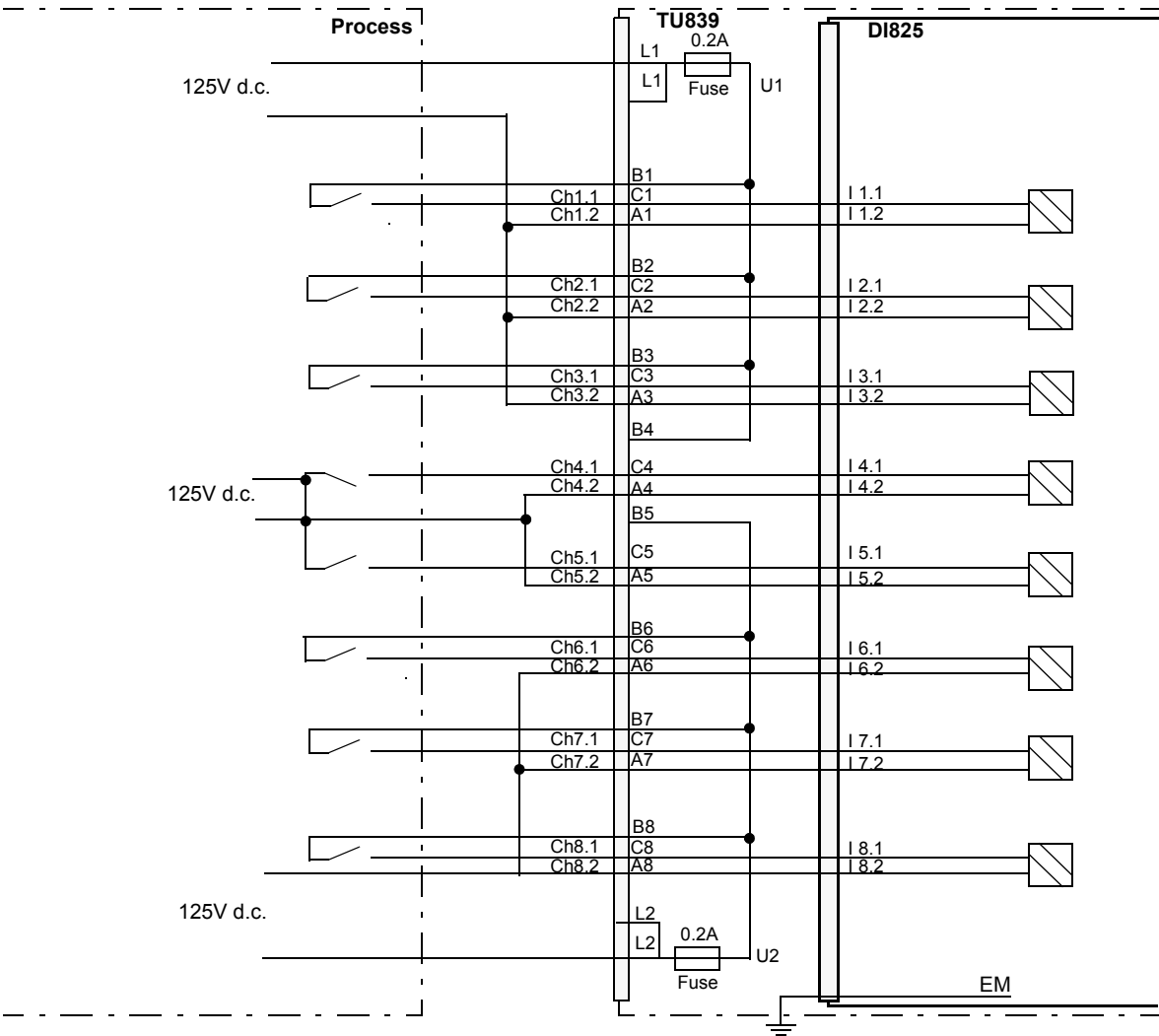


Figure 131. DI825 with TU839 Extended MTU Process Connections

Figure 132 shows the process connections for the DI825 when installed on a TU851 Extended MTU.

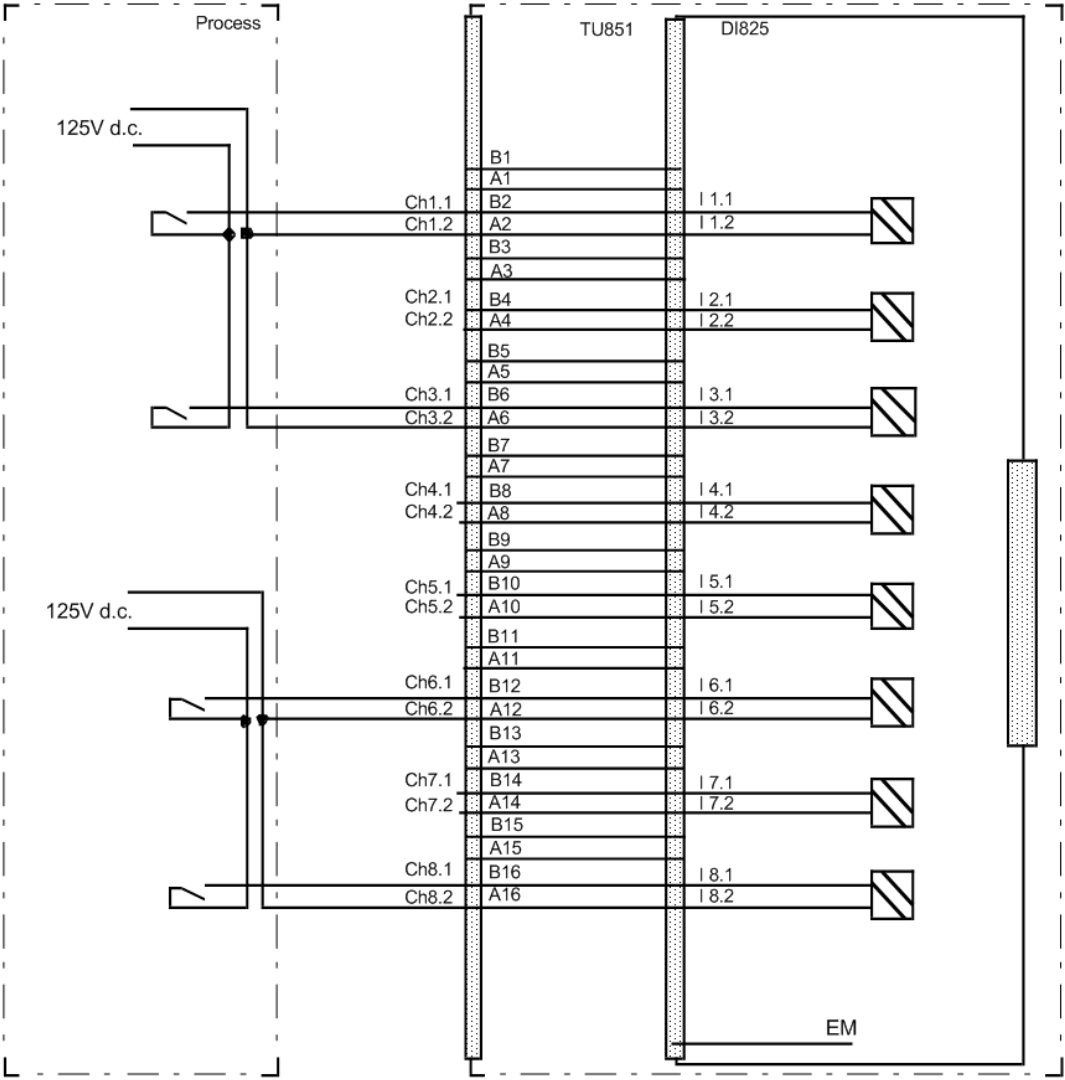


Figure 132. DI825 with TU851 Extended MTU Process Connections

## DI828 Digital Input Module, 120 V a.c./d.c.

### Features

- 16 channels for 120 V AC/DC inputs.
- Individually isolated channels.
- Input status indicators.
- Voltage supervision of field input power.
- Signal filtering.

### Description

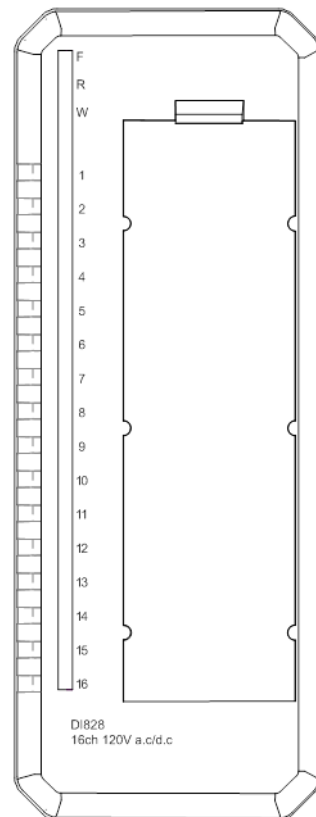
The DI828 is an 16 channel 120 V a.c./d.c. digital input module for the S800 I/O. The module has 16 digital inputs. The AC input voltage range is 77 - 130 V and the input current is 8.5 mA at 120V AC. The DC input voltage range is 75 - 130 V and the input current is 2.4 mA at 120V DC. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED, optical isolation barrier and an analog filter.

Channel 1 can be used as process voltage supervision input for channels 2-8 and channel 16 can be used as process voltage supervision input for channels 9-15.

If process voltage supervision is enabled, channels 2-8 and 9-15 will indicate channel error unless a high level voltage is applied on channels 1 and 16 respectively.

The detection time for this supervision is 70 ms. If process voltage supervision is disabled channels 1 and 16 can be used as normal input channels.





The input channels can be digitally filtered. The filter times can be set in the range 1, 2, 4, and 8 ms. This means that noise pulses shorter than the filter time are filtered out and pulses longer than the filter time get through the filter.

The DI828 can be used on the Extended MTU TU851. The TU851 Extended MTU provides two terminals per channel.

**Technical Data***Table 63. DI828 Digital Input Module Specifications*

<b>Feature</b>	<b>DI828 Digital Input Module</b>
Number of channels	16
Rated voltage (process power supply range)	120 V a.c/d.c.
Input voltage range, “1”	77 to 130 V ±75 to 130 V d.c.
Input voltage range, “0”	0 to 30 V a.c. ±0 to 20 V d.c.
Nominal input channel current	8.5 mA @ 120V a.c. 2.4 mA @ 120V d.c.
Input frequency range a.c.	47 - 63 Hz
Impedance	14.2 kΩ (a.c.) 50 kΩ (d.c.)
Maximum Field Cable Length	200 meters (219 yd.) 100pF/m. for a.c. 600 meters (656 yd.) for d.c.
Filter times (digital, selectable)	2.5 ± 0.5, 5 ± 1, 10 ± 2, 20 ± 4ms
Analog filter On/Off delay	5/10 ms
Process voltage supervision	2 channels, Ch1and Ch16 can act as process power supervision.
Current consumption 5 V (Modulebus)	Typ 45 mA Max 60 mA
Power dissipation <sup>(1)</sup>	3.5 W
Isolation	Channelwise isolated (RIV 250)
Module termination units	TU851
MTU keying code	EB

Table 63. DI828 Digital Input Module Specifications (Continued)

Feature	DI828 Digital Input Module
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated.

Block Diagram DI828

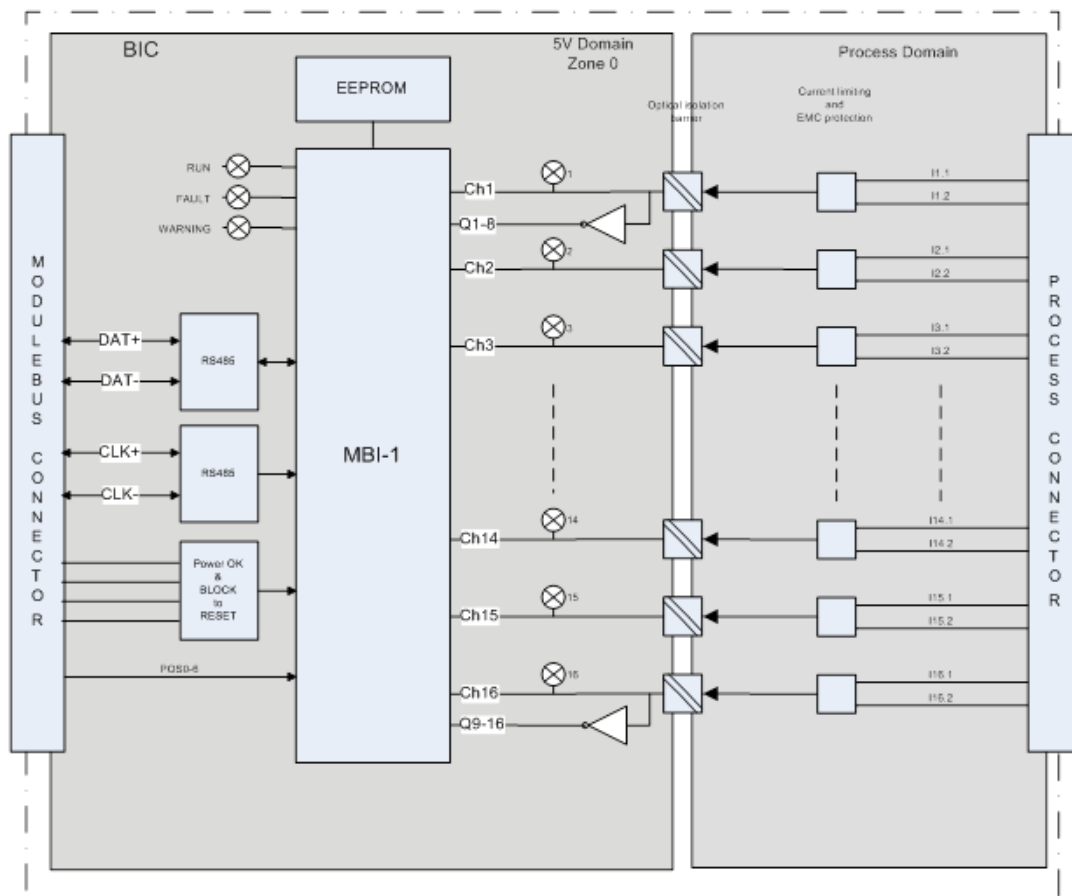


Figure 133. DI828-Block Diagram

**Process Connections***Table 64. DI828 Process Connections*

<b>Process Connection</b>	<b>TU851 Terminal</b>
Ch 1.1 Input	B1
Ch 1.2 Input	A1
Ch 2.1 Input	B2
Ch 2.2 Input	A2
Ch 3.1 Input	B3
Ch 3.2 Input	A3
Ch 4.1 Input	B4
Ch 4.2 Input	A4
Ch 5.1 Input	B5
Ch 5.2 Input	A5
Ch 6.1 Input	B6
Ch 6.2 Input	A6
Ch 7.1 Input	B7
Ch 7.2 Input	A7
Ch 8.1 Input	B8
Ch 8.2 Input	A8
Ch 9.1 Input	B9
Ch 9.2 Input	A9
Ch 10.1 Input	B10
Ch 10.2 Input	A10
Ch 11.1 Input	B11

Table 64. DI828 Process Connections (Continued)

Process Connection	TU851 Terminal
Ch 11.2 Input	A11
Ch 12.1 Input	B12
Ch 12.2 Input	A12
Ch 13.1 Input	B13
Ch 13.2 Input	A13
Ch 14.1 Input	B14
Ch 14.2 Input	A14
Ch 15.1 Input	B15
Ch 15.2 Input	A15
Ch 16.1 Input	B16
Ch 16.2 Input	A16

Figure 134 shows the process connections for the Digital Input Module DI828 when installed on a TU851 Extended Module Termination Unit.

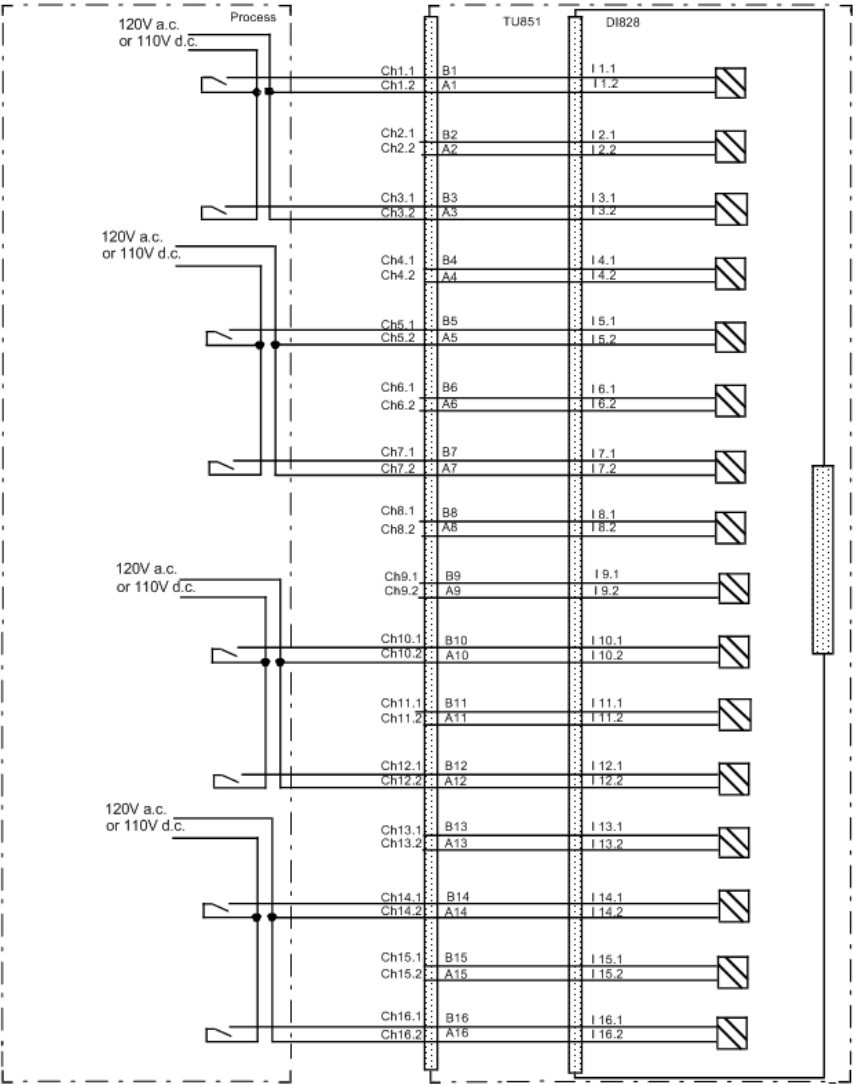


Figure 134. DI828 with TU851 Extended Module Termination Unit

## DI830 Digital Input Module, 24 V d.c. with SOE, Current Sinking

### Features

- 16 channels for 24 V d.c. inputs with current sinking.
- 2 isolated groups of 8 channels with voltage supervision.
- Input status indicators.
- Sequence of event (SOE) functionality.
- Shutter filter.

### Description

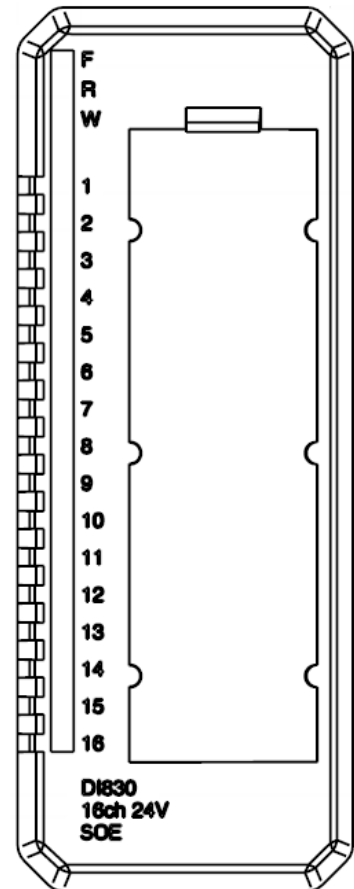
The DI830 is a 16 channel 24 V d.c. digital input module for the S800 I/O. The input voltage range is 18 to 30 V d.c. and the input current is 6 mA at 24 V d.c.

Each input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

The module cyclically performs self-diagnostics. Module diagnostics include:

- Process power supply supervision (results in a module failure, if detected).
- Event queue full.
- Time synchronization missing.

The input signals can be digitally filtered. The filter time can be set in the range 0 to 100 ms. This means that pulses shorter than the filter time are filtered out and pulses longer than specified filter time get through the filter.





Eight different types of MTUs can be used. The Extended MTU (for example TU830/TU833) enables three wire connection to the sensors without additional terminals. The Compact MTU (for example TU810, TU814) has terminals for process voltage supervision inputs, but requires external terminals for distribution of process power supply to the sensors. The TU818 Compact MTU provides connection to 2-wire sensors without external marshaling. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. TU850 provides one disconnectable PTC fused sensor/transmitter power outlet terminal per channel.

### **Event Recording**

The DI830 Input Module can be used for event recording (SOE), that is, changing signals at digital input channels can be announced together with a time stamp indicating when it occurred. Events are generated on both positive and negative going edges of the signal. The time stamp has a resolution of 0.4 millisecond, and is compensated for the filter time.

The module has intermediate storage for 32 events.

The SOE functionality can be switched on and off per channel.

For all channels with enabled SOE capability, a shutter filter is implemented that prevents intermediate storage for events from overflow. The shutter filter is closed as soon as the number of events generated within the shutter period (0-255 seconds) exceeds the shutter trigger number (0-255 changes). The shutter filter remains closed as long as the recovery time (0-65535 seconds) has not expired.

### **Simple Digital Input**

If no event recording is used, the DI830 acts like a simple digital input device.

**Technical Data***Table 65. DI830 Digital Input Module Specifications*

<b>Feature</b>	<b>DI830 Digital Input Module</b>
Number of channels	16 (2 x 8), current sinking
Rated voltage (Process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	13 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	7.4 mA @ 24 V d.c.
Input Current, "1"	>4.0 mA
Input Current, "0"	<2.0 mA
Input impedance	3.2 k $\Omega$
Maximum field cable length	600 m (656 yd.)
Filter times (digital, selectable)	0 to 100 ms
Shutter filter Shutter period Shutter trigger Recovery time	0... 255 s 0... 255 changes 0... 65535 s
Event recording resolution	0.4 ms
Event recording accuracy	-0.3 ms to +0.7 ms
Process voltage supervision	2 channels (1 per group)
Current consumption 5 V (Modulebus)	120 mA (max.) 100 mA (typ.)
Power dissipation <sup>(1)</sup>	2.3 W
Isolation	Yes, opto

*Table 65. DI830 Digital Input Module Specifications (Continued)*

<b>Feature</b>	<b>DI830 Digital Input Module</b>
Mounting termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU838 or TU850
MTU keying code	AA
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

- (1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volt.

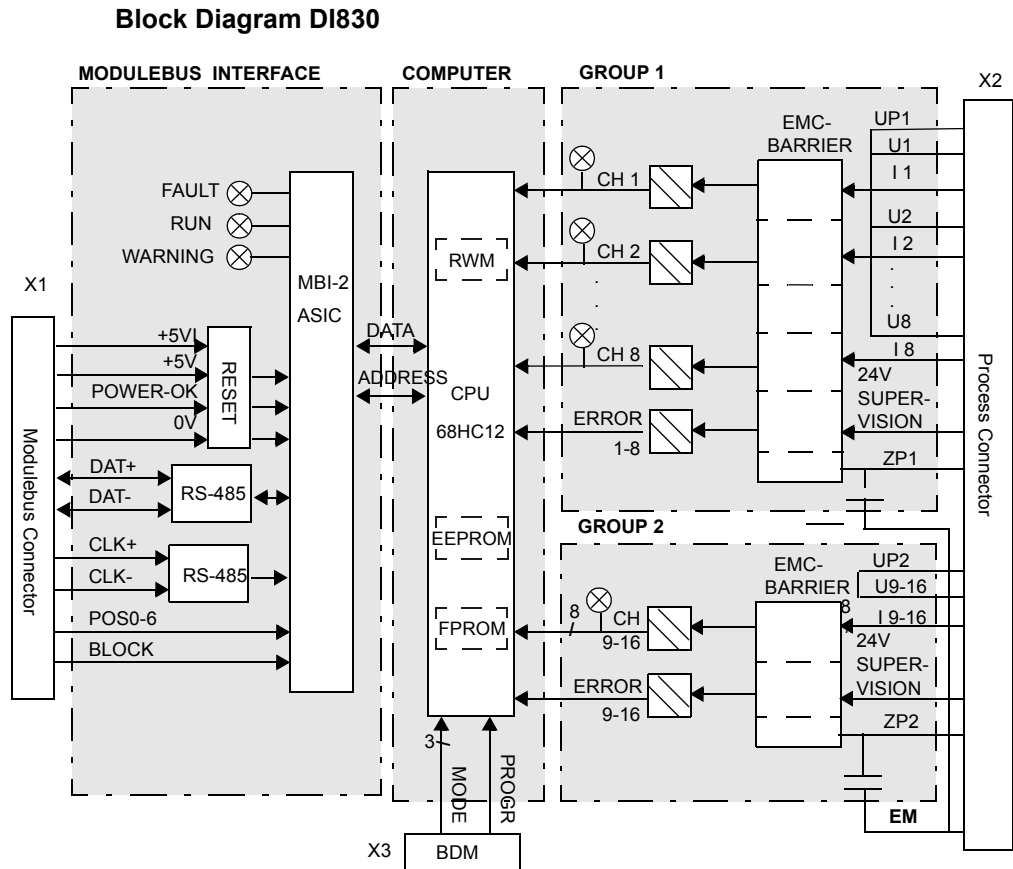


Figure 135. DI830 Block Diagram

**Process Connections***Table 66. DI830 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 Male Connector (1)</b>	<b>TU818 Terminal</b>	<b>TU830/ TU833 Terminal</b>	<b>TU838 Terminal</b>	<b>TU850 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	C1, A1	B1, B2	A1 (F1)	A1, A2
Ch1 Input	C1	3	D1	C1	B1	B1
Ch 2 Input	B1	16	B1	C2	B2	B2
Ch1/Ch2, L1-	A1	-	-	A1, A2	A2	-
Ch 3/Ch 4, L1+	-	-	C2, A2	B3, B4	A3 (F2)	A3, A4
Ch 3 Input	C2	4	D2	C3	B3	B3
Ch 4 Input	B2	17	B2	C4	B4	B4
Ch 3/Ch 4, L1-	A2	-	-	A3, A4	A4	-
Ch 5/Ch 6, L1+	-	-	C3, A3	B5, B6	A5 (F3)	A5, A6
Ch 5 Input	C3	5	D3	C5	B5	B5
Ch 6 Input	B3	18	B3	C6	B6	B6
Ch 5/Ch 6, L1-	A3	-	-	A5, A6	A6	-
Ch 7/Ch 8, L1+	-	-	C4, A4	B7, B8	A7 (F4)	A7, A8
Ch 7 Input	C4	6	D4	C7	B7	B7
Ch 8 Input	B4	19	B4	C8	B8	B8
Ch 7/Ch8, L1-	A4	-	-	A7, A8	A8	-
Ch 9/Ch 10, L2+	-	-	C5, A5	B9, B10	A9 (F5)	A9, A10

Table 66. DI830 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU838 Terminal	TU850 Terminal
Ch 9 Input	C5	7	D5	C9	B9	B9
Ch 10 Input	B5	20	B5	C10	B10	B10
Ch 9/Ch 10, L2-	A5	-	-	A9, A10	A10	-
Ch 11/Ch 12, L2+	-	-	C6, A6	B11, B12	A11 (F6)	A11, A12
Ch 11 Input	C6	8	D6	C11	B11	B11
Ch 12 Input	B6	21	B6	C12	B12	B12
Ch 11/Ch 12, L2-	A6	-	-	A11, A12	A12	-
Ch 13/Ch 14, L2+	-	-	C7, A7	B13, B14	A13 (F7)	A13, A14
Ch 13 Input	C7	9	D7	C13	B13	B13
Ch 14 Input	B7	22	B7	C14	B14	B14
Ch 13/Ch 14, L2-	A7	-	-	A13, A14	A14	-
Ch 15/ Ch16, L2+	-	-	C8, A8	B15, B16	A15 (F8)	A15, A16
Ch 15 Input	C8	10	D8	C15	B15	B15
Ch 16 Input	B8	23	B8	C16	B16	B16
Ch 15/Ch16, L2-	A8	-	-	A15, A16	A16	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 136 shows the process connections for the Digital Input Module DI830 when installed on a TU830 Extended MTU.

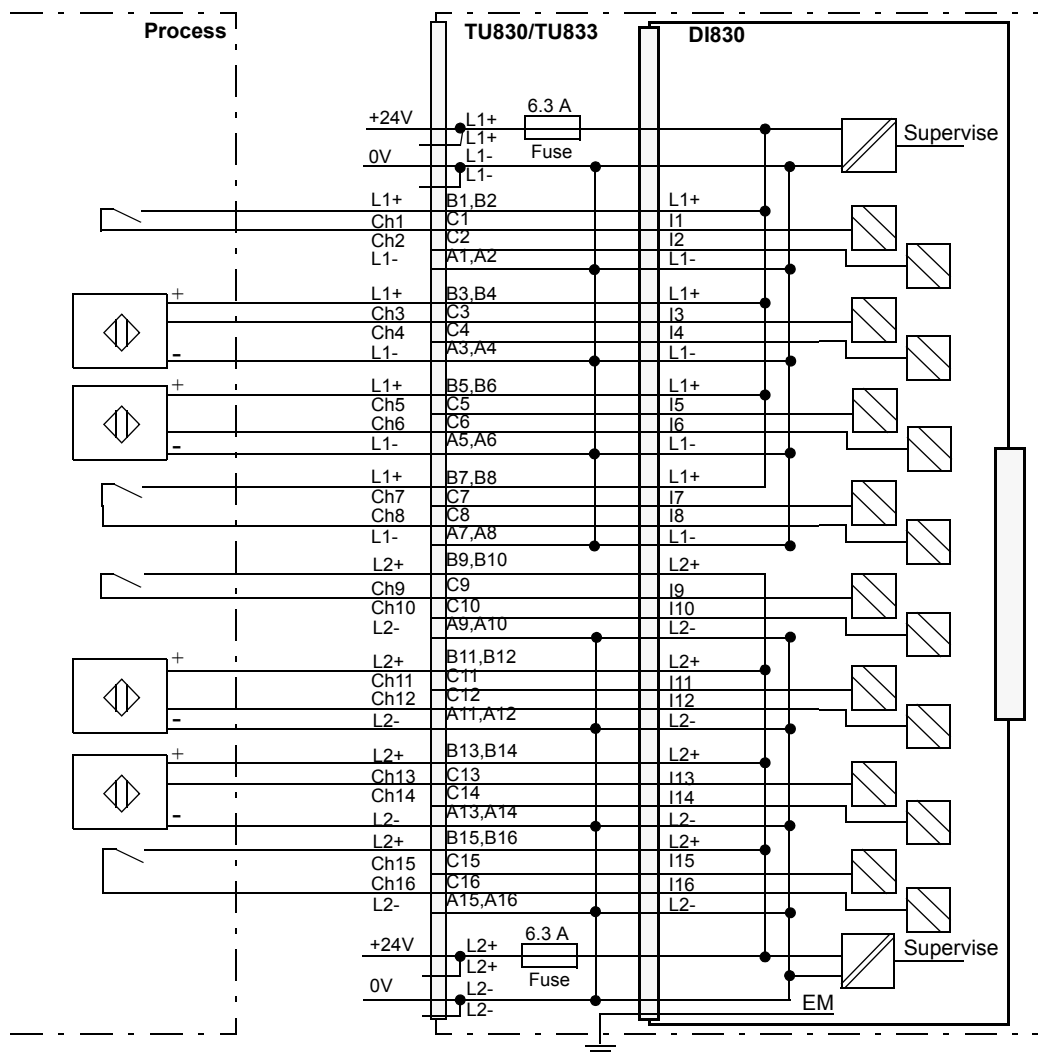


Figure 136. DI830 with TU830 Extended MTU Process Connections

Figure 137 shows the process connections for the Digital Input Module DI830 when installed on a TU838 Extended MTU.

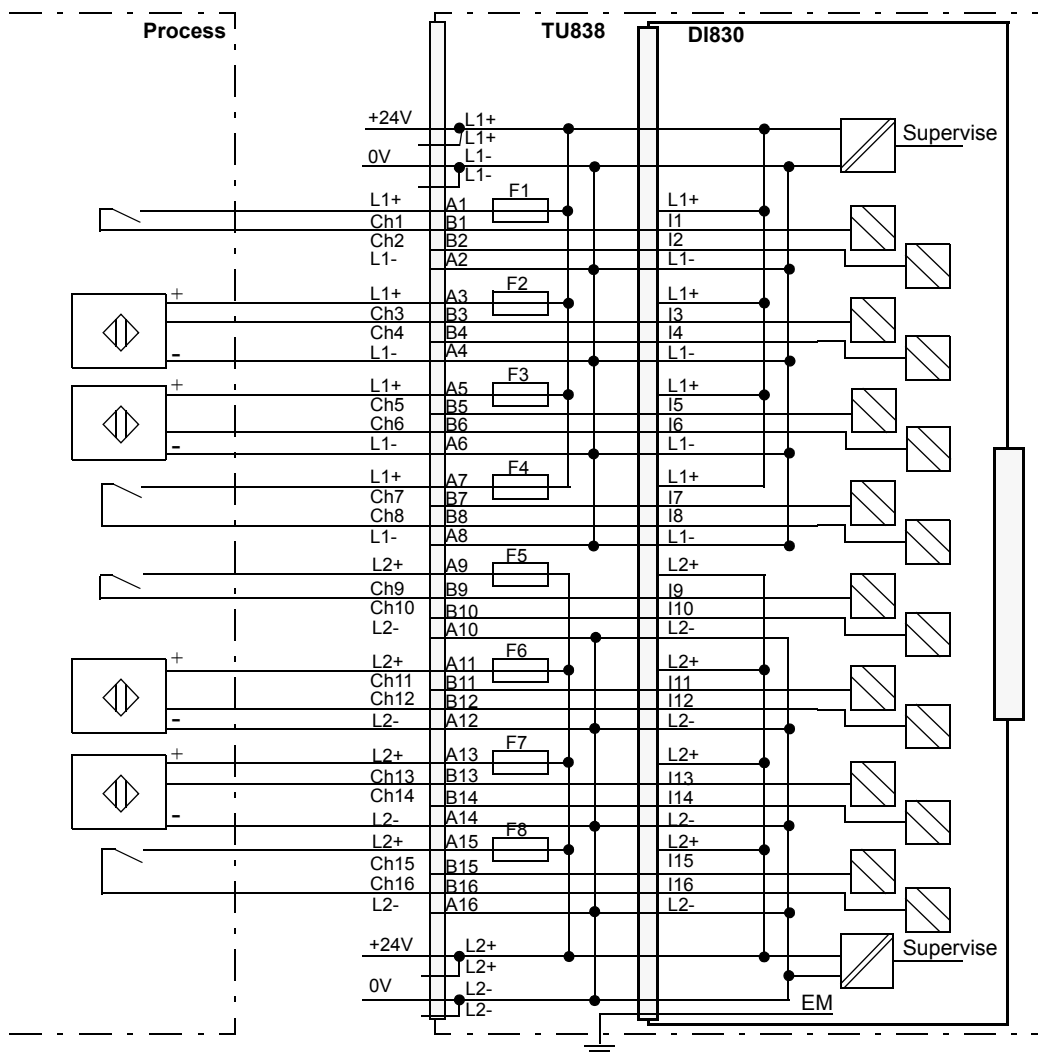


Figure 137. DI830 with TU838 Extended MTU Process Connections



Figure 138 shows the process connections for the DI830 when installed on a TU810 or TU814 Compact MTU.

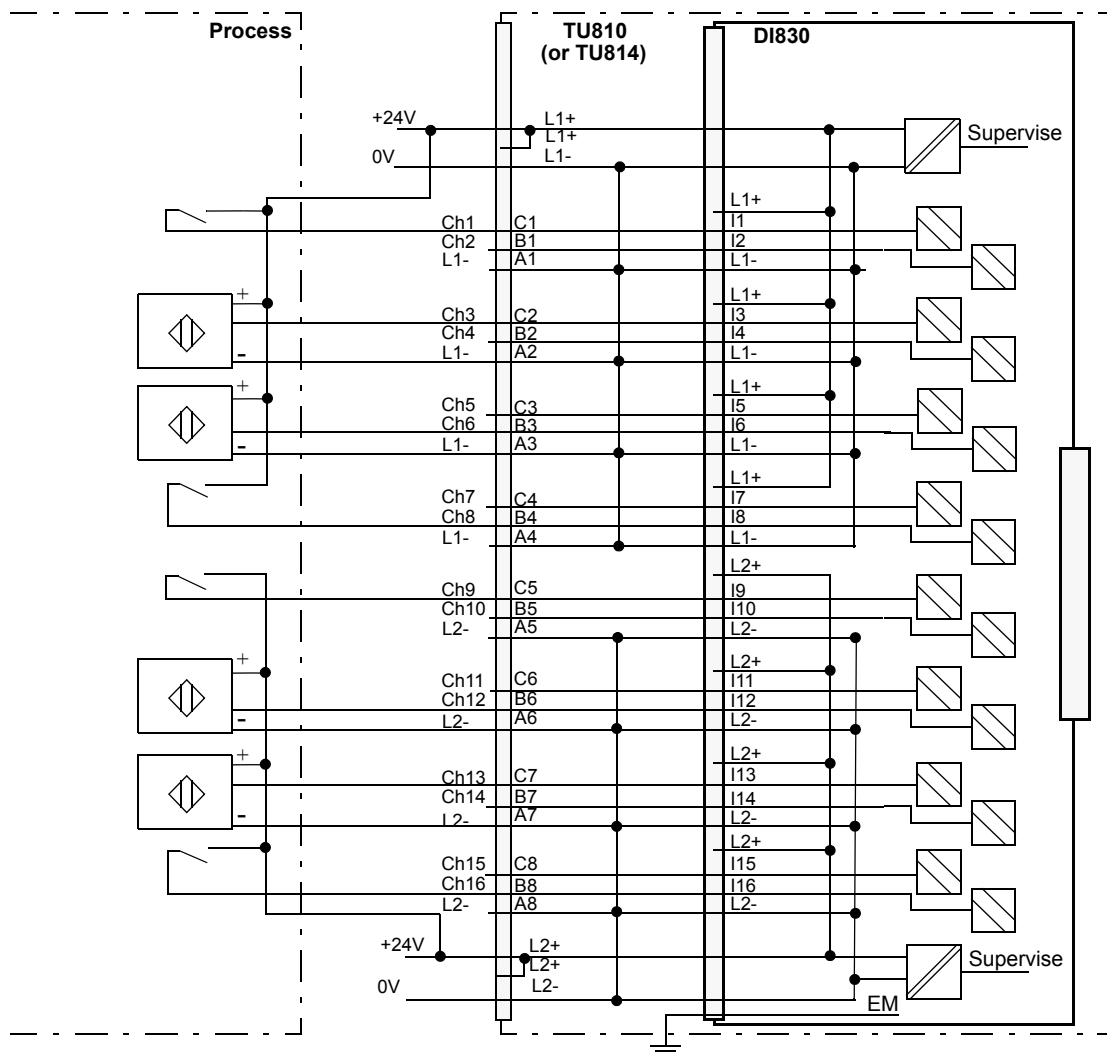


Figure 138. DI830 with TU810 or TU814 Compact MTU Process Connections

Figure 139 shows the process connections for the DI830 when installed on a TU812 Compact MTU.

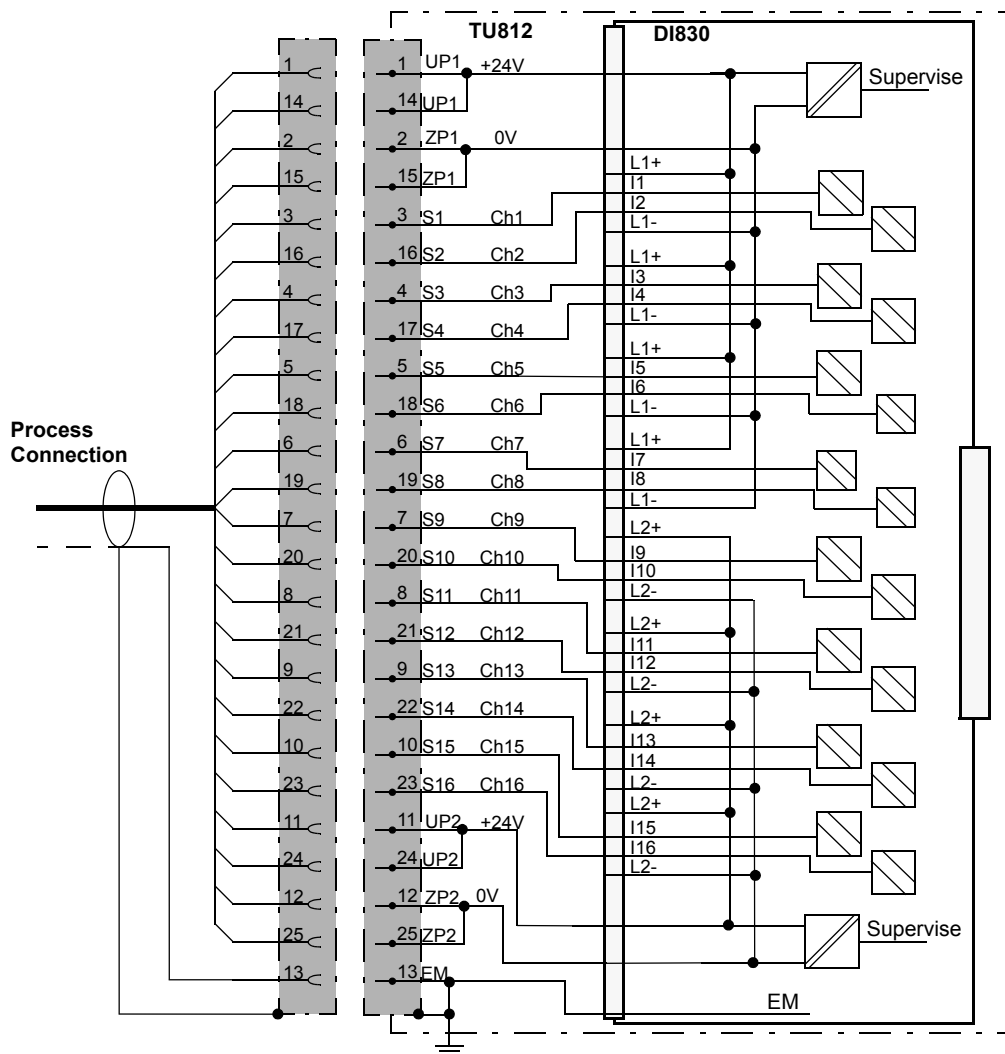


Figure 139. DI830 with TU812 Compact MTU Process Connections

Figure 140 shows the process connections for the DI830 when installed on a TU850 Extended MTU.

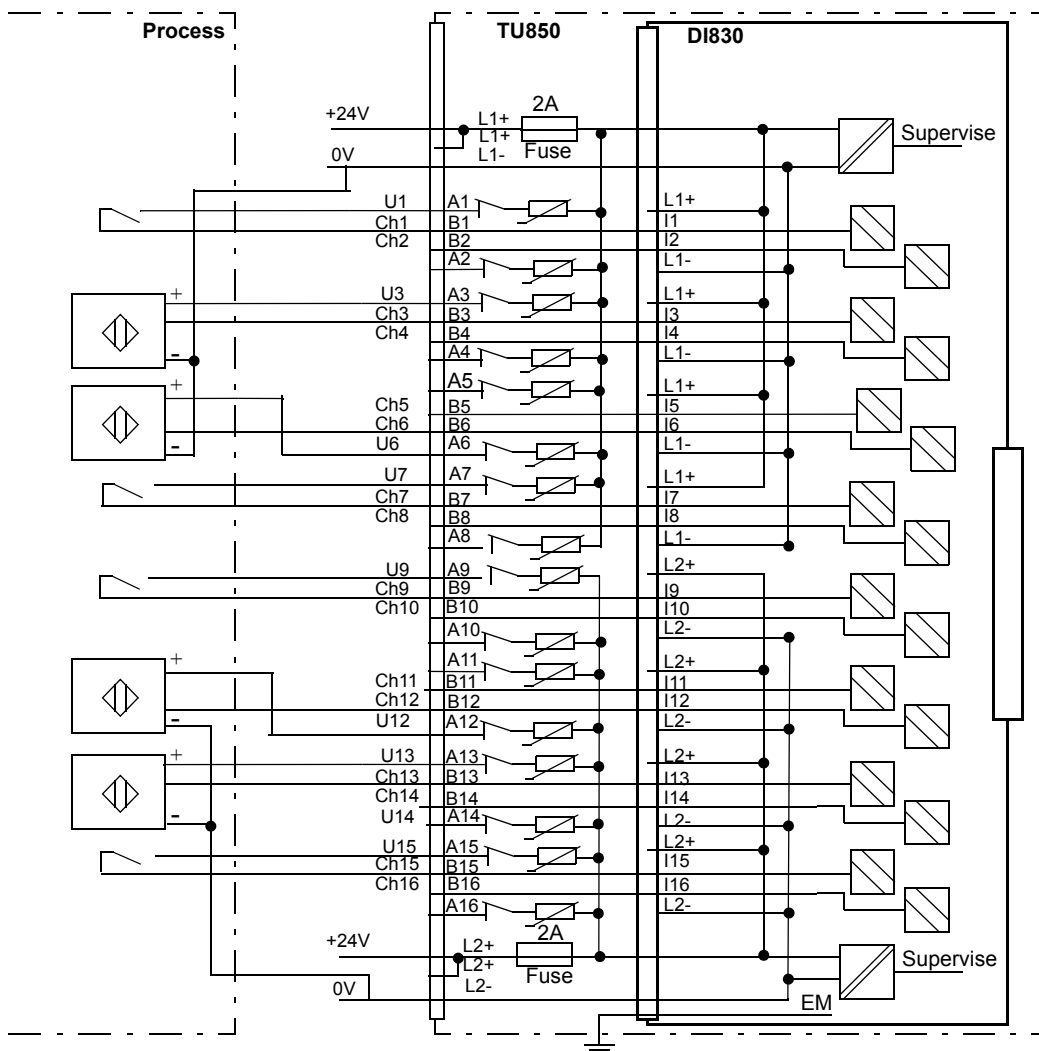


Figure 140. DI830 with TU850 Extended MTU Process Connection.

Figure 141 shows the process connections for the DI830 when installed on a TU818 Compact MTU.

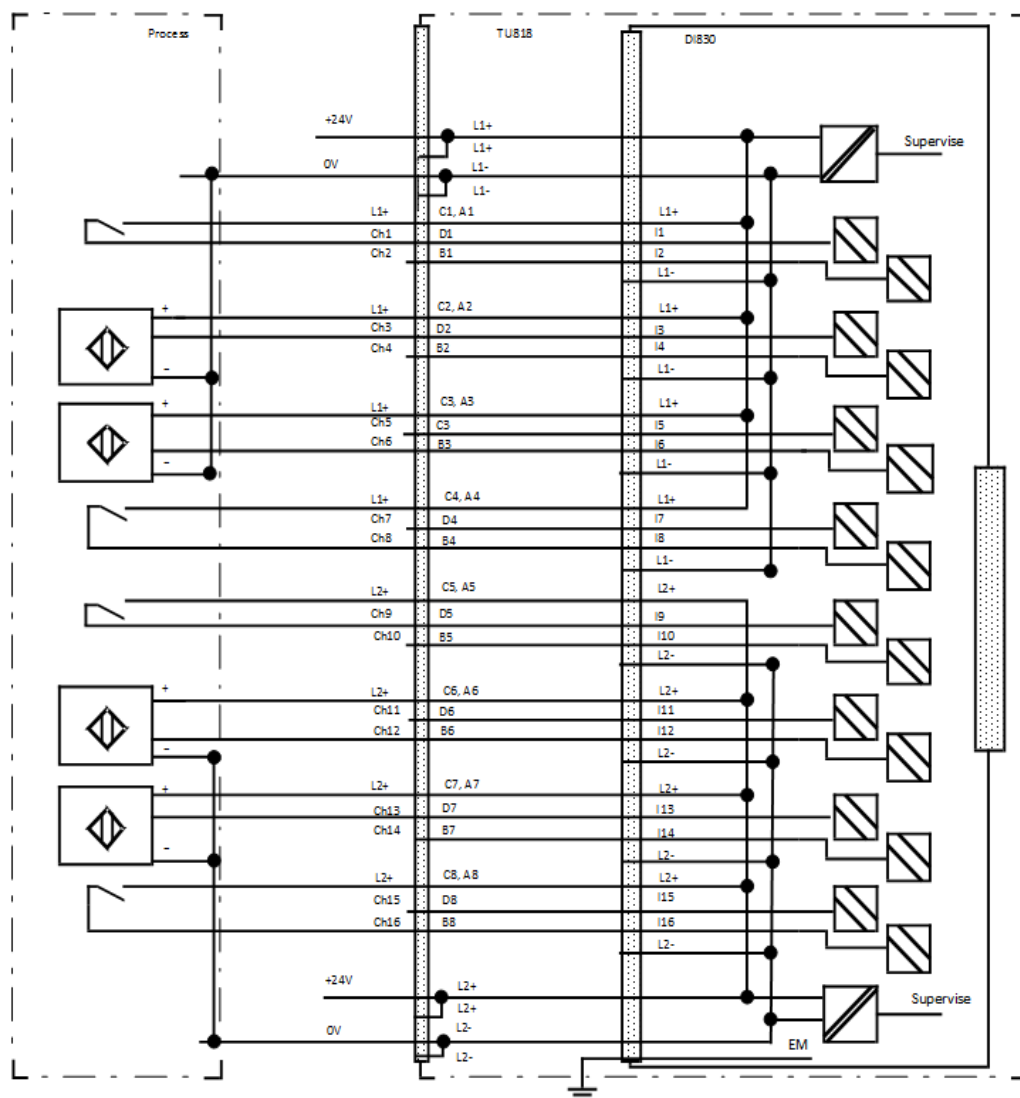


Figure 141. DI830 with TU818 Compact MTU Process Connections

## DI831 Digital Input Module, 48 V d.c. with SOE, Current Sinking

### Features

- 16 channels for 48 V d.c. inputs with current sinking.
- 2 isolated groups of 8 channels with voltage supervision.
- Input status indicators.
- Sequence of event (SOE) functionality.
- Shutter filter.

### Description

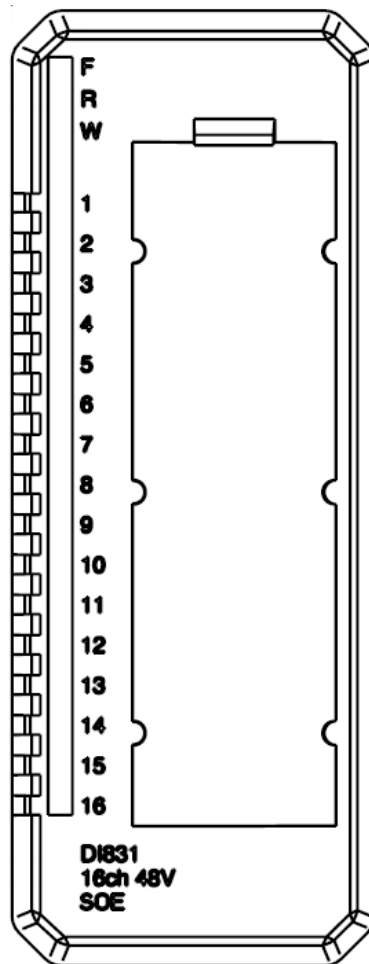
The DI831 is a 16 channel 48 V d.c. digital input module for the S800 I/O. The input voltage range is 36 to 60 V d.c. and the input current is 4 mA at 48 V d.c.).

Each input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

The module cyclically performs self-diagnostics. Module diagnostics include:

- Process power supply supervision (results in a module failure, if detected)
- Event queue full.
- Time synchronization missing.

The input signals can be digitally filtered. The filter time can be set in the range 0 to 100 ms. This means that pulses shorter than the filter time are filtered out and



pulses longer than specified get through the filter.

Eight different types of MTUs can be used. The Extended MTU (for example TU830/TU833) enables three wire connection to the sensors without additional terminals. The Compact MTU (for example TU810, TU 814 ) has terminals for process voltage supervision inputs, but requires external terminals for distribution of process power supply to the sensors. The TU818 Compact MTU provides connection to 2-wire sensors without external marshaling. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. TU850 provides one disconnectable PTC fused sensor/transmitter power outlet terminal per channel.

### **Event Recording**

The DI831 Input Module can be used for event recording (SOE), that is, changing signals at digital input channels can be announced together with a time stamp indicating when it occurred. Events are generated on both positive and negative going edges of the signals. The time stamp has a resolution of 0.4 millisecond, and is compensated for the filter time.

The module has intermediate storage for 32 events.

The SOE functionality can be switched on and off per channel.

For all channels with enabled SOE capability, a shutter filter is implemented that prevents intermediate storage for events from overflow. The shutter filter is closed as soon as the number of events generated within the shutter period (0-255 seconds) exceeds the shutter trigger number (0-255 changes). The shutter filter remains closed as long as the recovery time (0-65535 seconds) has not expired.

### **Simple Digital Input**

If no event recording is used, the DI831 acts like a simple digital input device.

**Technical Data***Table 67. DI831 Digital Input Module Specifications*

<b>Feature</b>	<b>DI831 Digital Input Module</b>
Number of channels	16 (2 x 8), current sinking
Rated voltage (Process power supply range)	48 V d.c. (36 to 60 V d.c).
Input voltage range, “1”	+30 to +60 V.
Input voltage range, “0”	-60 to +10 V
Nominal input channel current	5 mA @ 48 V d.c.
Input impedance	9.6 kΩ
Maximum field cable length	600 meters, (656 yd.)
Bounce filter times (digital, selectable)	0 to 100 ms
Shutter filter Shutter period Shutter trigger Recovery time	0... 255 s 0... 255 changes 0... 65535 s
Event recording resolution	0.4 ms
Event recording accuracy	-0.3 ms to +0.7 ms
Process voltage supervision	2 channels (1 per group)
Current consumption 5 V (Modulebus)	120 mA (max.) 100 mA (typ.)
Power dissipation <sup>(1)</sup>	3.2 W
Isolation	Yes, opto
Module termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU838 and TU850
MTU keying code	BD

Table 67. DI831 Digital Input Module Specifications (Continued)

Feature	DI831 Digital Input Module
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 48 Volt.

Block Diagram DI831

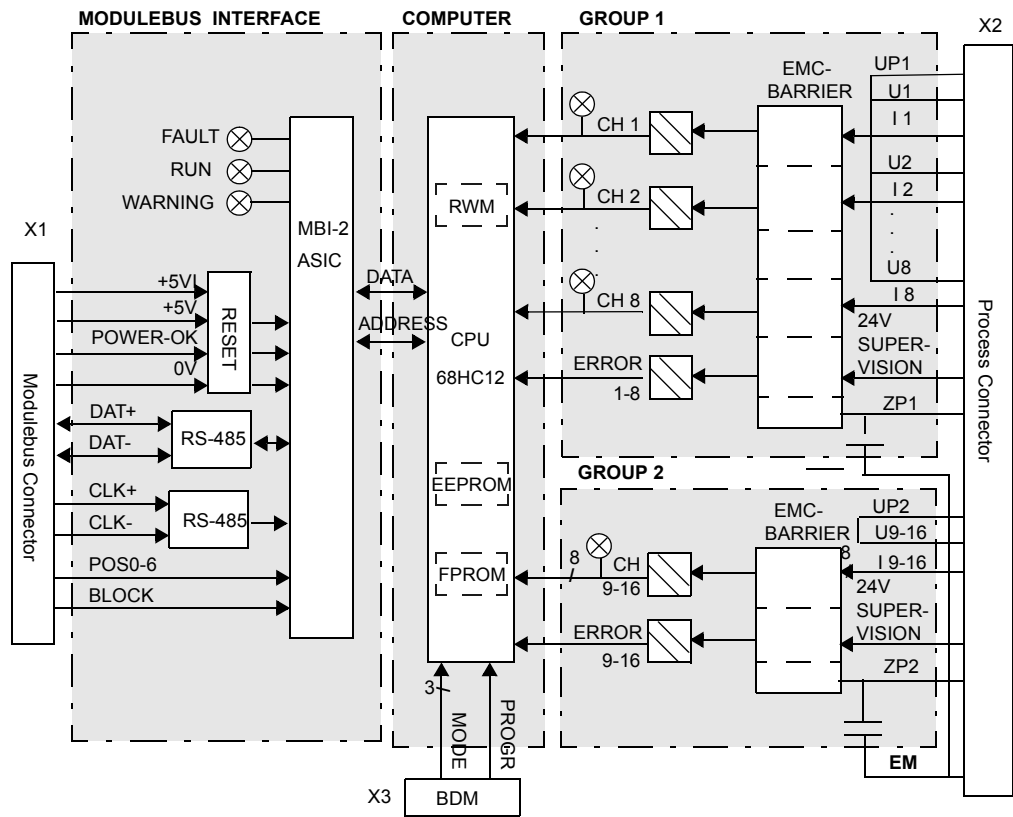


Figure 142. DI831 Block Diagram



**Process Connections***Table 68. DI831 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 Male Connector (1)</b>	<b>TU818 Terminal</b>	<b>TU830/ TU833 Terminal</b>	<b>TU838 Terminal</b>	<b>TU850 Terminal</b>
+48 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	C1, A1	B1, B2	A1 (F1)	A1, A2
Ch1 Input	C1	3	D1	C1	B1	B1
Ch 2 Input	B1	16	B1	C2	B2	B2
Ch1/Ch2, L1-	A1	-	-	A1, A2	A2	-
Ch 3/Ch 4, L1+	-	-	C2, A2	B3, B4	A3 (F2)	A3, A4
Ch 3 Input	C2	4	D2	C3	B3	B3
Ch 4 Input	B2	17	B2	C4	B4	B4
Ch 3/Ch 4, L1-	A2	-	-	A3, A4	A4	-
Ch 5/Ch 6, L1+	-	-	C3, A3	B5, B6	A5 (F3)	A5, A6
Ch 5 Input	C3	5	D3	C5	B5	B5
Ch 6 Input	B3	18	B3	C6	B6	B6
Ch 5/Ch 6, L1-	A3	-	-	A5, A6	A6	-
Ch 7/Ch 8, L1+	-	-	C4, A4	B7, B8	A7 (F4)	A7, A8
Ch 7 Input	C4	6	D4	C7	B7	B7
Ch 8 Input	B4	19	B4	C8	B8	B8
Ch 7/Ch8, L1-	A4	-	-	A7, A8	A8	-
Ch 9/Ch 10, L2+	-	-	C5, A5	B9, B10	A9 (F5)	A9, A10

Table 68. DI831 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU838 Terminal	TU850 Terminal
Ch 9 Input	C5	7	D5	C9	B9	B9
Ch 10 Input	B5	20	B5	C10	B10	B10
Ch 9/Ch 10, L2-	A5	-	-	A9, A10	A10	-
Ch 11/Ch 12, L2+	-	-	C6, A6	B11, B12	A11 (F6)	A11, A12
Ch 11 Input	C6	8	D6	C11	B11	B11
Ch 12 Input	B6	21	B6	C12	B12	B12
Ch 11/Ch 12, L2-	A6	-	-	A11, A12	A12	-
Ch 13/Ch 14, L2+	-	-	C7, A7	B13, B14	A13 (F7)	A13, A14
Ch 13 Input	C7	9	D7	C13	B13	B13
Ch 14 Input	B7	22	B7	C14	B14	B14
Ch 13/Ch 14, L2-	A7	-	-	A13, A14	A14	-
Ch 15/ Ch16, L2+	-	-	C8, A8	B15, B16	A15 (F8)	A15, A16
Ch 15 Input	C8	10	D8	C15	B15	B15
Ch 16 Input	B8	23	B8	C16	B16	B16
Ch 15/Ch16, L2-	A8	-	-	A15, A16	A16	-
+48 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 143 shows the process connections for the Digital Input Module DI831 when installed on a TU830 Extended MTU.

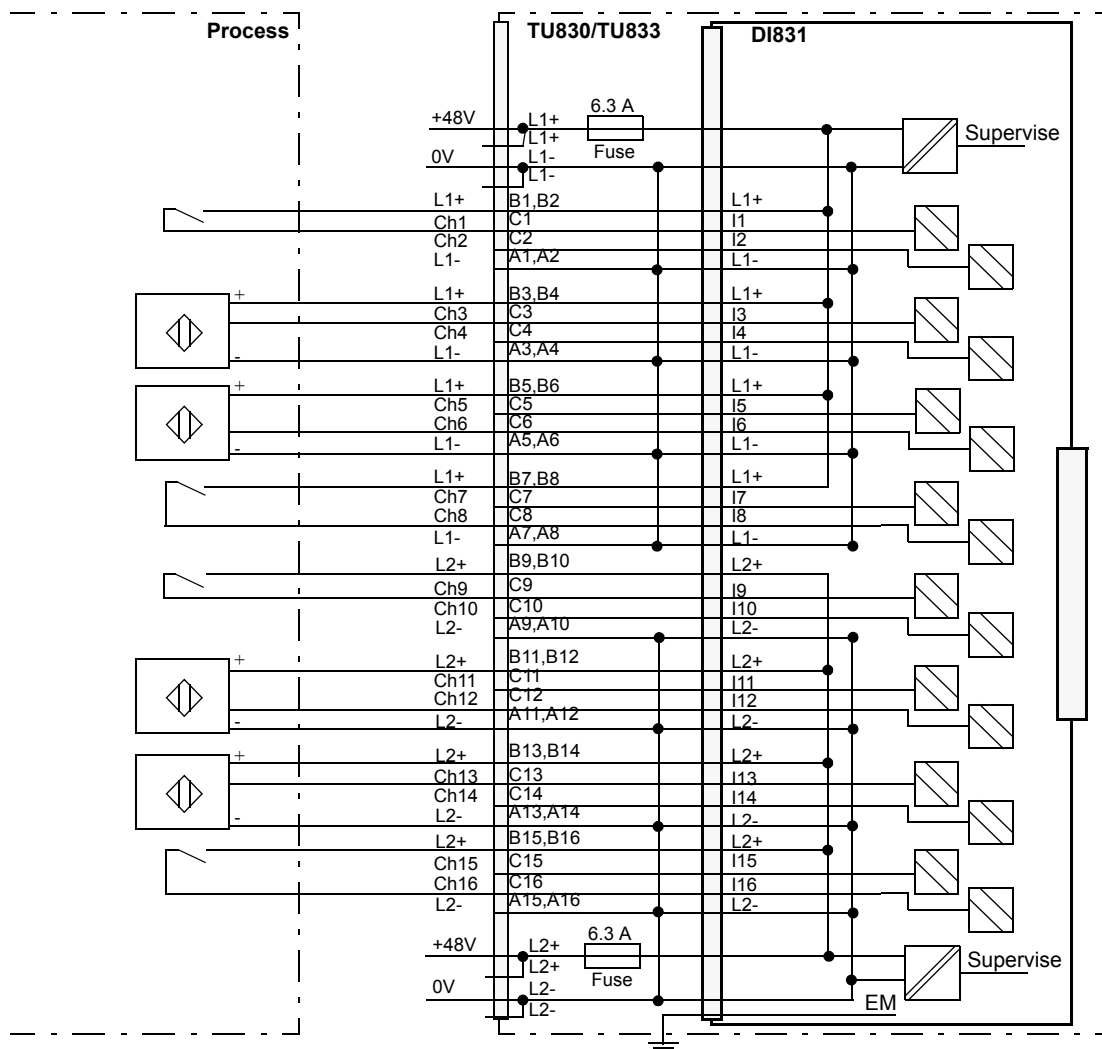


Figure 143. DI831 with TU830 Extended MTU Process Connections

Figure 144 shows the process connections for the Digital Input Module DI831 when installed on a TU838 Extended MTU.

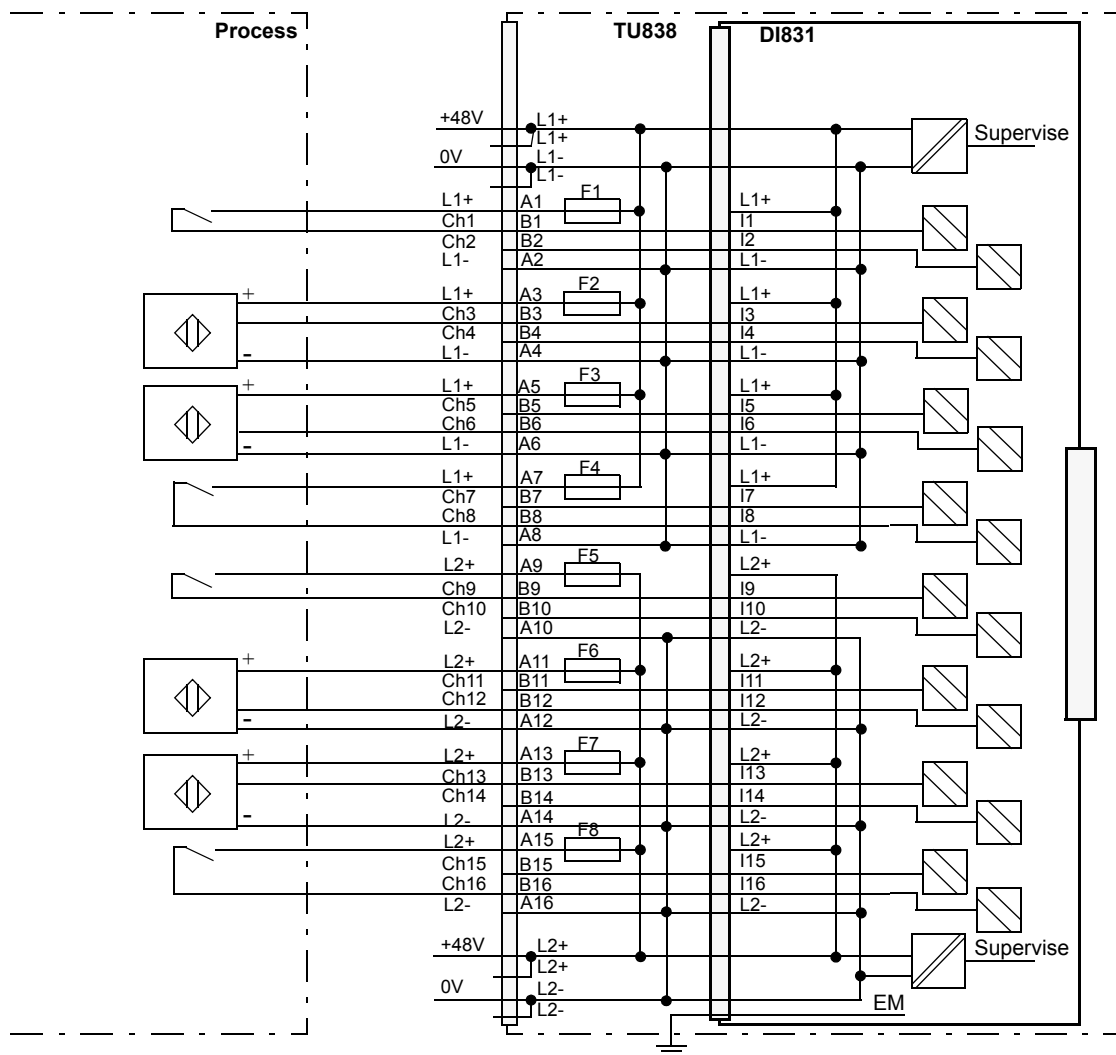


Figure 144. DI831 with TU838 Extended MTU Process Connections

Figure 145 shows the process connections for the DI831 when installed on a TU810 or TU814 Compact MTU.

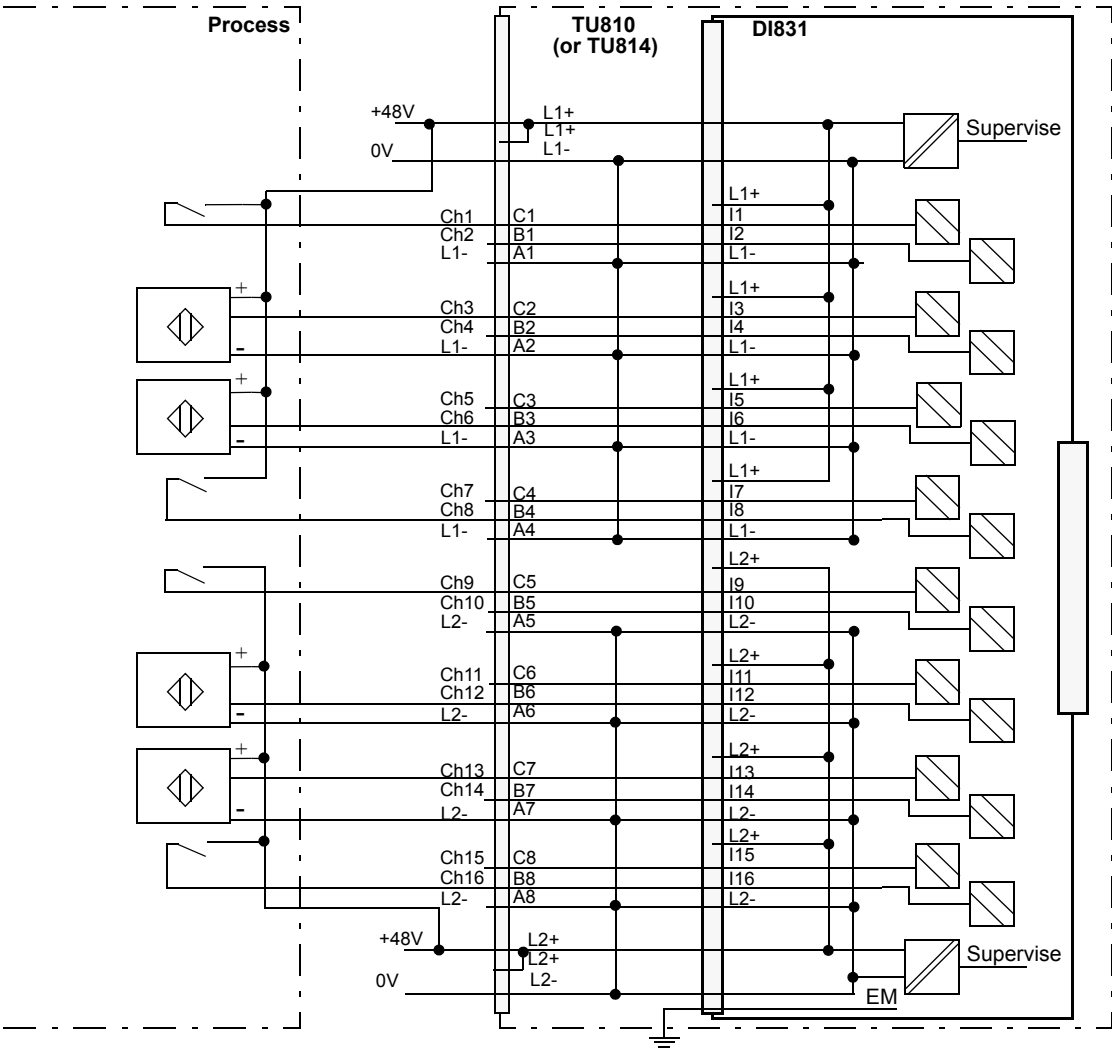


Figure 145. DI831 with TU810 or TU814 Compact MTU Process Connections

Figure 146 shows the process connections for the DI831 when installed on a TU812 Compact MTU.

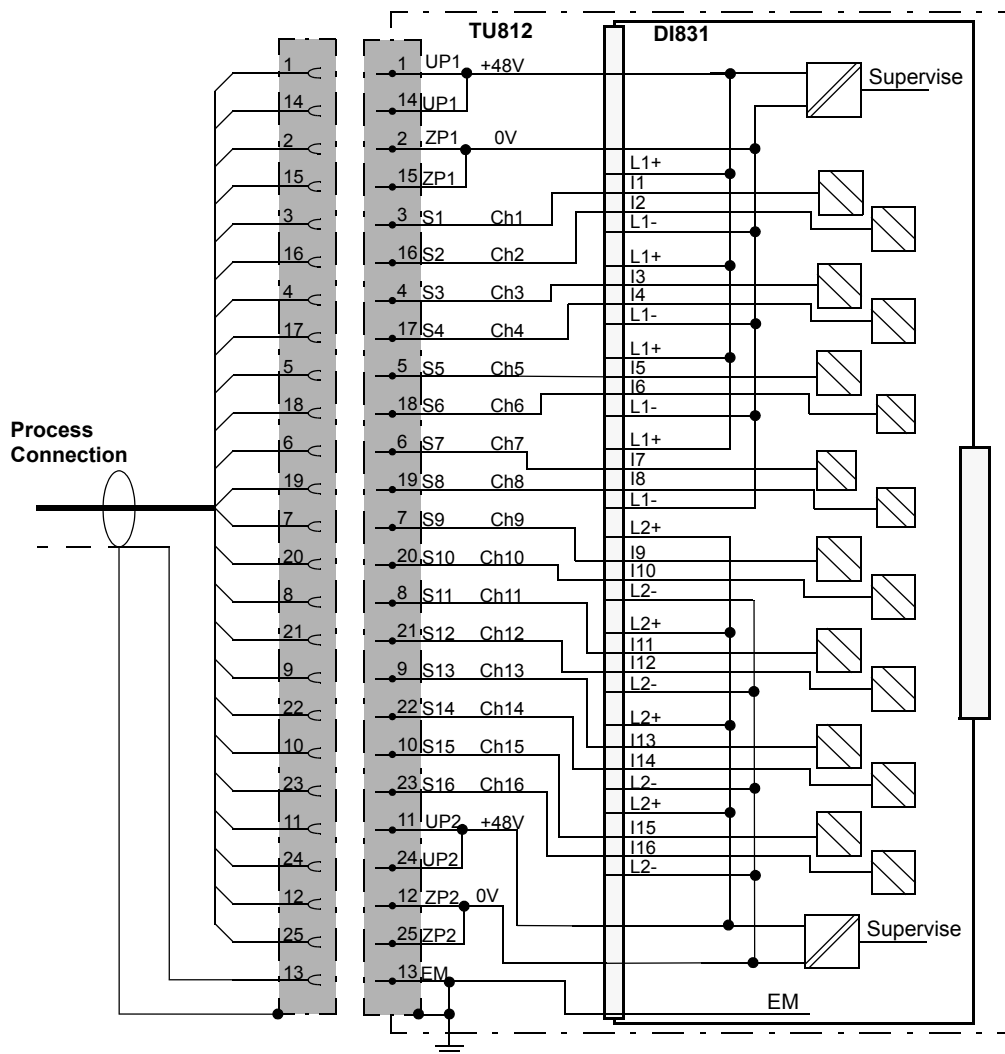


Figure 146. DI831 with TU812 Compact MTU Process Connections

Figure 147 shows the process connection for the DI831 when installed on a TU850 Extended MTU.

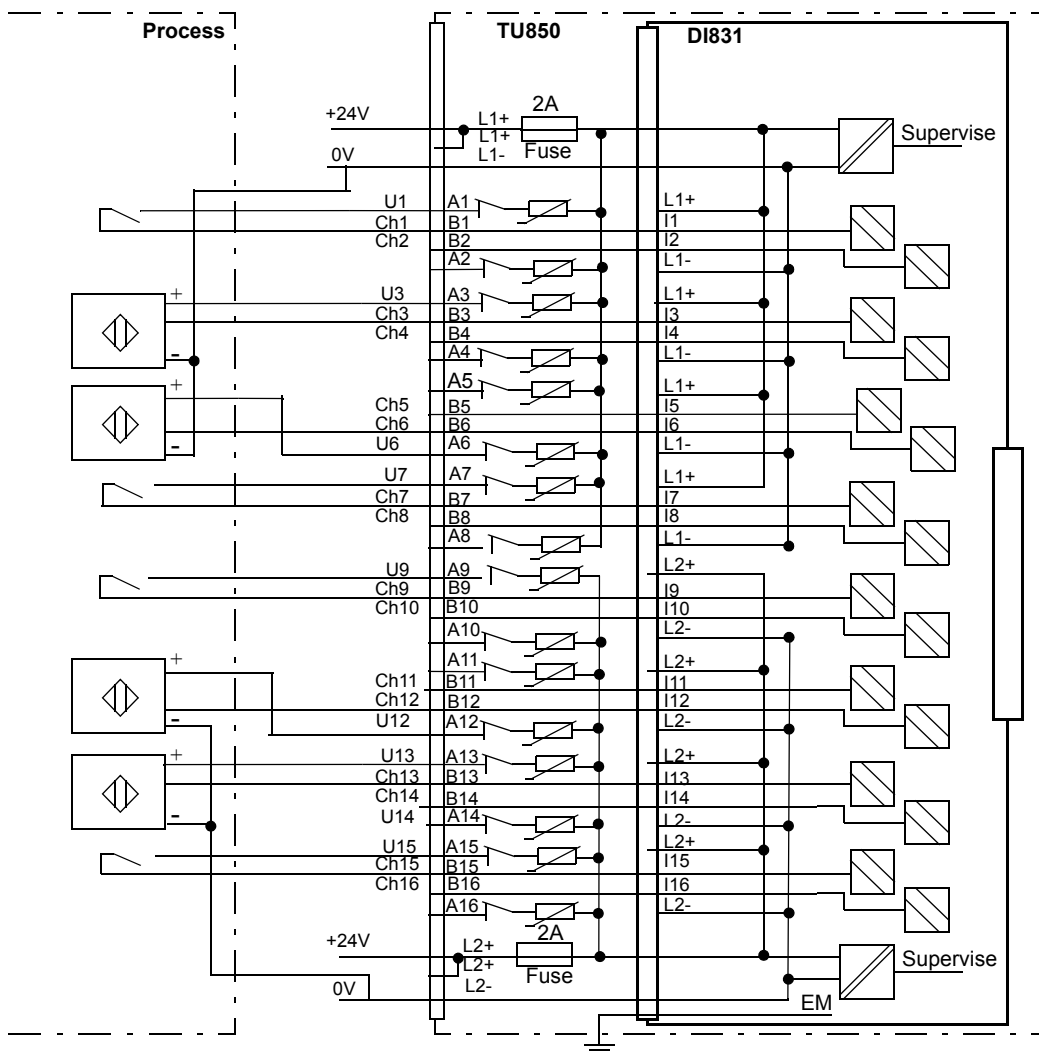


Figure 147. DI831 with TU850 Extended MTU Process Connection.

Figure 148 shows the process connections for the DI831 when installed on a TU818 Compact MTU.

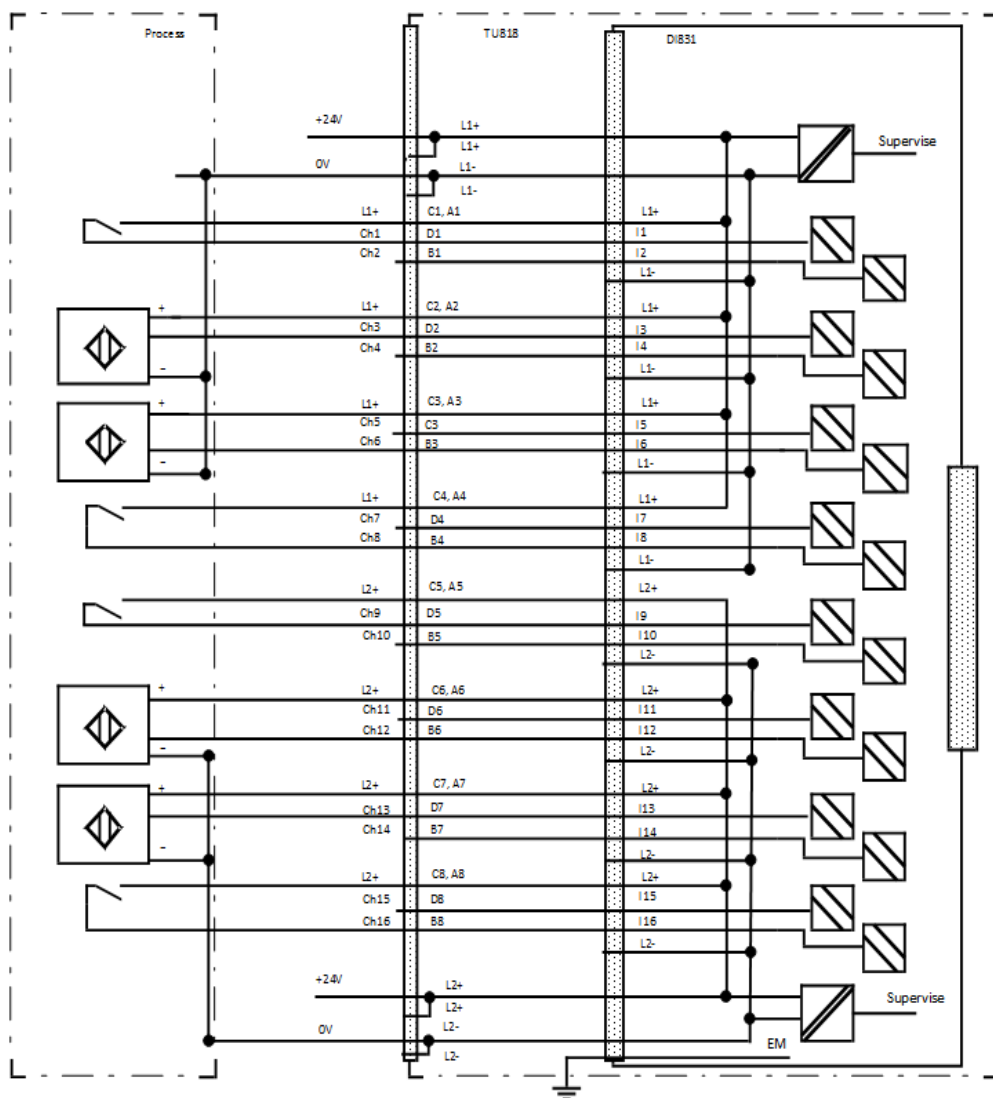


Figure 148. DI831 with TU818 Compact MTU Process Connections



## DI840 Digital Input Module

### Features

- 16 channels for 24 V d.c. inputs with current sinking.
- 1 group of 16 isolated from ground.
- Input status indicators.
- Advanced on-board diagnostics.
- Sequence of events.
- Redundant or single applications.
- Transducer power distribution.

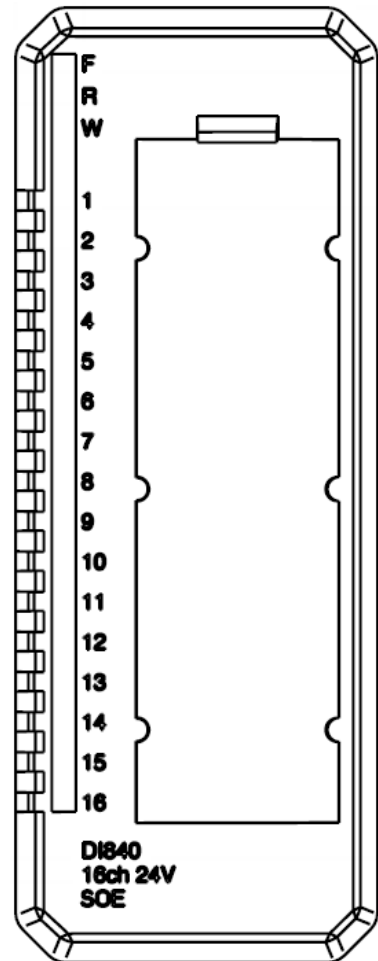
### Description

The DI840 is a 16 channel 24 V d.c. digital input module for single or redundant applications. The input voltage range is 18 to 30 V d.c. and the input current is 7 mA at 24 V d.c.

Each input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

The transducer power is supervised and current limited; one output per two input channels.

The Sequence of Event function (SOE) can collect events with a resolution of 1 ms. The event queue can contain up to 257 events. The function includes a Shutter filter for filtering out unwanted events.



The module cyclically performs self-diagnostics. Module diagnostics include:

- Process power supply supervision and transducer over current supervision are reported as External Channel Error. Error detection time is  $\leq 500$  ms.
- The internal channel circuitries are tested with test patterns. Error from those tests will be reported as Internal Channel Error. The error detection time is  $\leq 100$  ms.
- Error in the common parts of the test functions is reported as Module Error. Error detection time is 12 ms.

The SOE function can report the following status in the event message – Channel value, Queue full, Synchronization jitter, Uncertain time, Shutter filter active and Channel error.

The input signals can be digitally filtered. The filter is selectable from 0 to 127 ms. This means that pulses shorter than the filter time will be filtered out and pulses longer than specified will get through the filter.

Seven different types of MTUs can be used for single applications. The Extended MTU (for example TU830/TU833) enables three wire connection to the sensors without additional terminals. The Compact MTU (for example TU810, TU814) has terminals for process voltage supervision inputs, but requires external terminals for distribution of process power supply to the sensors. The TU818 Compact MTU provides connection to 2-wire sensors without external marshaling. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant applications there are three types of MTUs, TU842 /TU852 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

**Technical Data***Table 69. DI840 Digital Input Module Specifications*

<b>Feature</b>	<b>DI840 Digital Input Module</b>
Number of channels	16, current sinking
Rated voltage (Process power supply range)	24 V d.c. (19.2 to 30 V)
Input voltage range, "1"	11 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	7 mA @ 24 V d.c.
Input current, "1"	> 3 mA
Input current, "0"	< 1.5 mA
Input impedance	3.3 k $\Omega$
Maximum field cable length	600 m (656 yd.)
Filter times (digital, selectable)	0 to 127 ms
Shutter filter Shutter period Shutter trigger Recovery time	2... 170 s 4 changes 0... 682 s
Event recording resolution	1 ms
Event recording accuracy	-0 ms / +1.3 ms
Sensor supply (per channel pair)	40mA (max), short circuit current 60 mA (max)
Current consumption 5 V (Modulebus)	100 mA
Current consumption 24 V (process power supply, UPx)	335 mA (max) (15 mA + sensor current)
Power dissipation <sup>(1)</sup>	2.7 W

Table 69. DI840 Digital Input Module Specifications (Continued)

Feature	DI840 Digital Input Module
Isolation	Yes, opto
Mounting termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU838, TU842, TU843 or TU852
MTU keying code	CD
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volt.

Block Diagram DI840

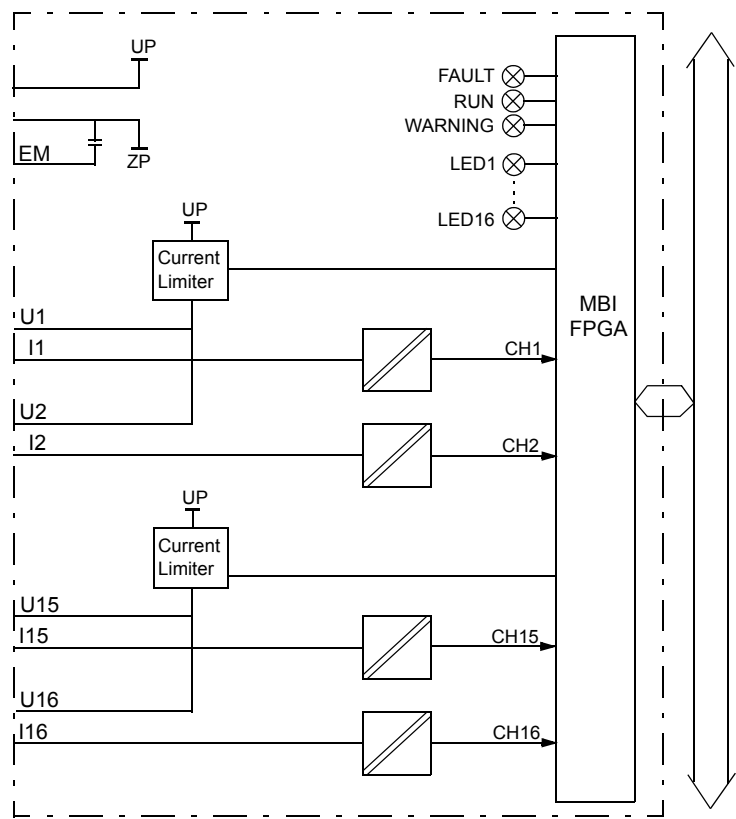


Figure 149. Block Diagram DI840

**Process Connections***Table 70. DI840 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 Male Connector (1)</b>	<b>TU818 Terminal</b>	<b>TU830/ TU833 Terminal</b>	<b>TU838 Terminal</b>	<b>TU842 TU843 Terminal</b>	<b>TU852 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+	1, 14 (X1a and X1b)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1-	2, 15 (X1a and X1b)
U1, U2	-	-	C1, A1	B1, B2	A1 (F1),-	B1, B2	3, 16 (X1b)
Ch1 Input	C1	3	D1	C1	B1	C1	3 (X1a)
Ch 2 Input	B1	16	B1	C2	B2	C2	16 (X1a)
Ch1/Ch2, L1-	A1	-	-	A1, A2	A2	A1, A2	-
U3, U4	-	-	C2, A2	B3, B4	A3 (F2),-	B3, B4	4, 17 (X1b)
Ch 3 Input	C2	4	D2	C3	B3	C3	4 (X1a)
Ch 4 Input	B2	17	B2	C4	B4	C4	17 (X1a)
Ch 3/Ch 4, L1-	A2	-	-	A3, A4	A4	A3, A4	-
U5, U6	-	-	C3, A3	B5, B6	A5 (F3),-	B5, B6	5, 18 (X1b)
Ch 5 Input	C3	5	D3	C5	B5	C5	5 (X1a)
Ch 6 Input	B3	18	B3	C6	B6	C6	18 (X1a)

Table 70. DI840 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU838 Terminal	TU842 TU843 Terminal	TU852 Terminal
Ch 5/Ch 6, L1-	A3	-	-	A5, A6	A6	A5, A6	-
U7, U8	-	-	C4, A4	B7, B8	A7 (F4),-	B7, B8	6, 19 (X1b)
Ch 7 Input	C4	6	D4	C7	B7	C7	6 (X1a)
Ch 8 Input	B4	19	B4	C8	B8	C8	19 (X1a)
Ch 7/Ch 8, L1-	A4	-	-	A7, A8	A8	A7, A8	-
U9, U10	-	-	C5, A5	B9, B10	A9 (F5),-	B9, B10	7, 20 (X1b)
Ch 9 Input	C5	7	D5	C9	B9	C9	7 (X1a)
Ch 10 Input	B5	20	B5	C10	B10	C10	20 (X1a)
Ch 9/Ch 10, L2-	A5	-	-	A9, A10	A10	A9, A10	-
U11, U12	-	-	C6, A6	B11, B12	A11 (F6),-	B11, B12	8, 21 (X1b)
Ch 11 Input	C6	8	D6	C11	B11	C11	8 (X1a)
Ch 12 Input	B6	21	B6	C12	B12	C12	21 (X1a)
Ch 11/Ch 12, L2-	A6	-	-	A11, A12	A12	A11, A12	-
U13, U14	-	-	C7, A7	B13, B14	A13 (F7),-	B13, B14	9, 22 (X1b)
Ch 13 Input	C7	9	D7	C13	B13	C13	9 (X1a)

Table 70. DI840 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU838 Terminal	TU842 TU843 Terminal	TU852 Terminal
Ch 14 Input	B7	22	B7	C14	B14	C14	22 (X1a)
Ch 13/Ch 14, L2-	A7	-	-	A13, A14	A14	A13, A14	-
U15, U16	-	-	C8, A8	B15, B16	A15 (F8),-	B15, B16	10, 23 (X1a)
Ch 15 Input	C8	10	D8	C15	B15	C15	10 (X1a)
Ch 16 Input	B8	23	B8	C16	B16	C16	23 (X1a)
Ch 15/Ch16, L2-	A8	-	-	A15, A16	A16	A15, A16	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+	11, 24 (X1a and X1b)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2-	12, 25 (X1a and X1b)

(1) Pin 13 connected to connector body for EM.



Figure 150 shows the process connections for the Digital Input Module DI840 when installed on a TU830 Extended MTU.

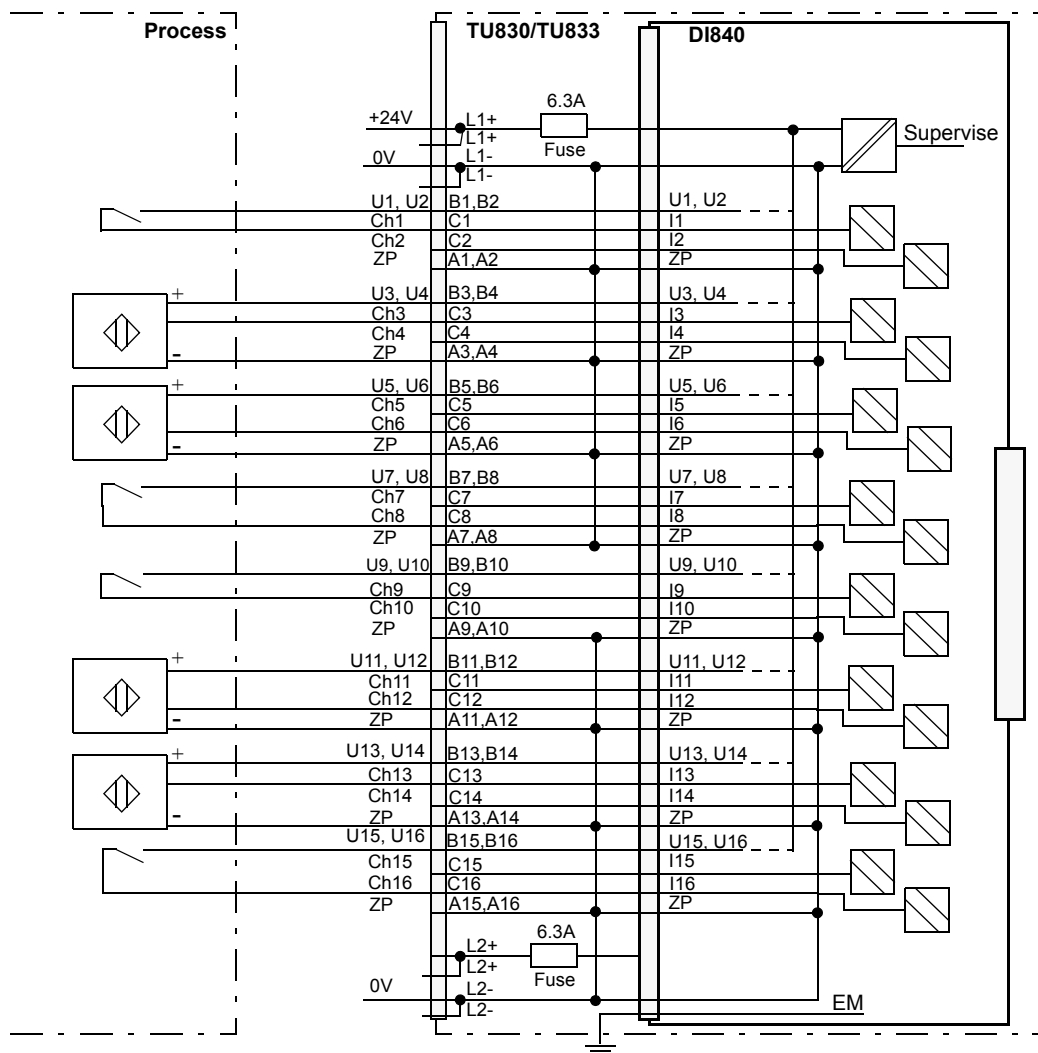


Figure 150. DI840 with TU830 Extended MTU Process Connections

Figure 151 shows the process connections for the Digital Input Module DI840 when installed on a TU838 Extended MTU.

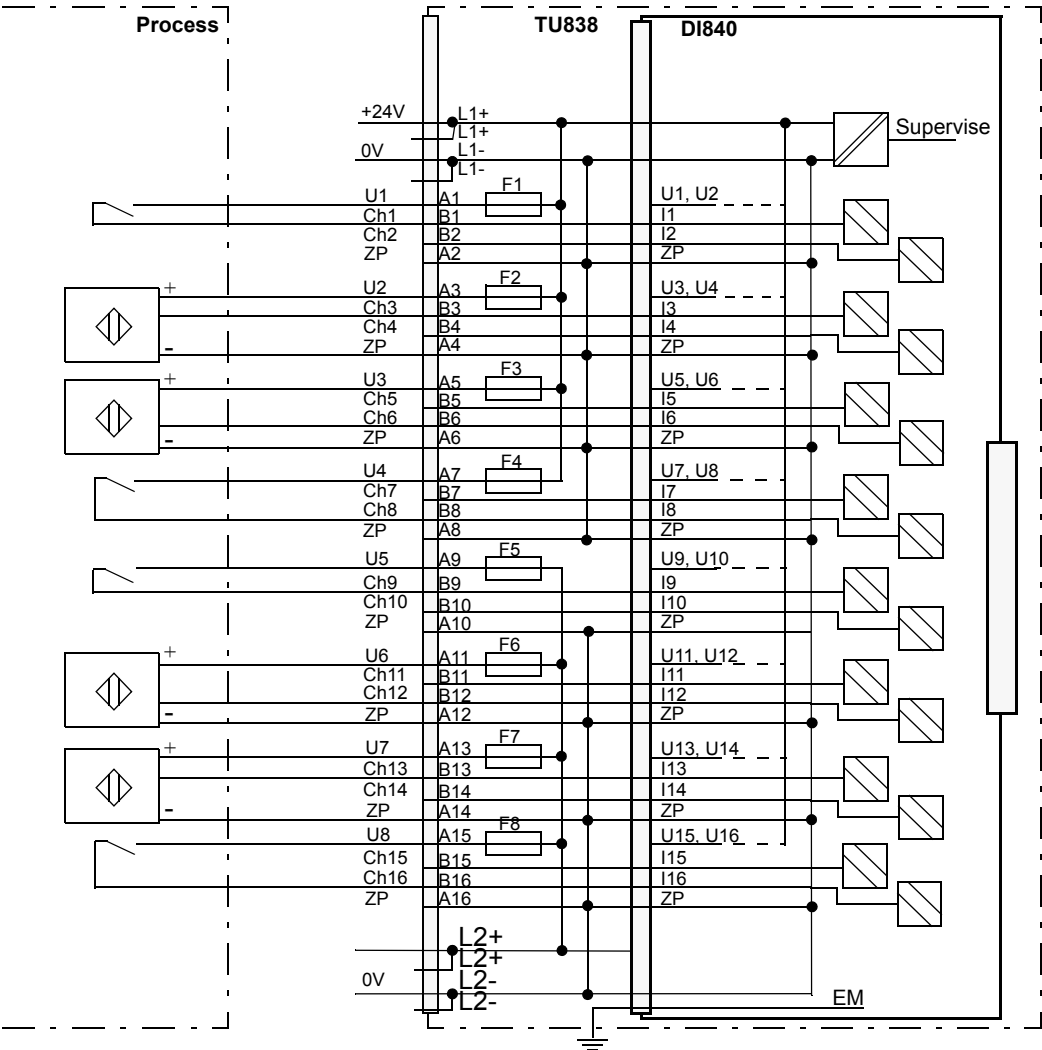


Figure 151. DI840 with TU838 Extended MTU Process Connections

Figure 152 shows the process connections for the Digital Input Module DI840 when installed on a TU810 or TU814 Compact MTU.

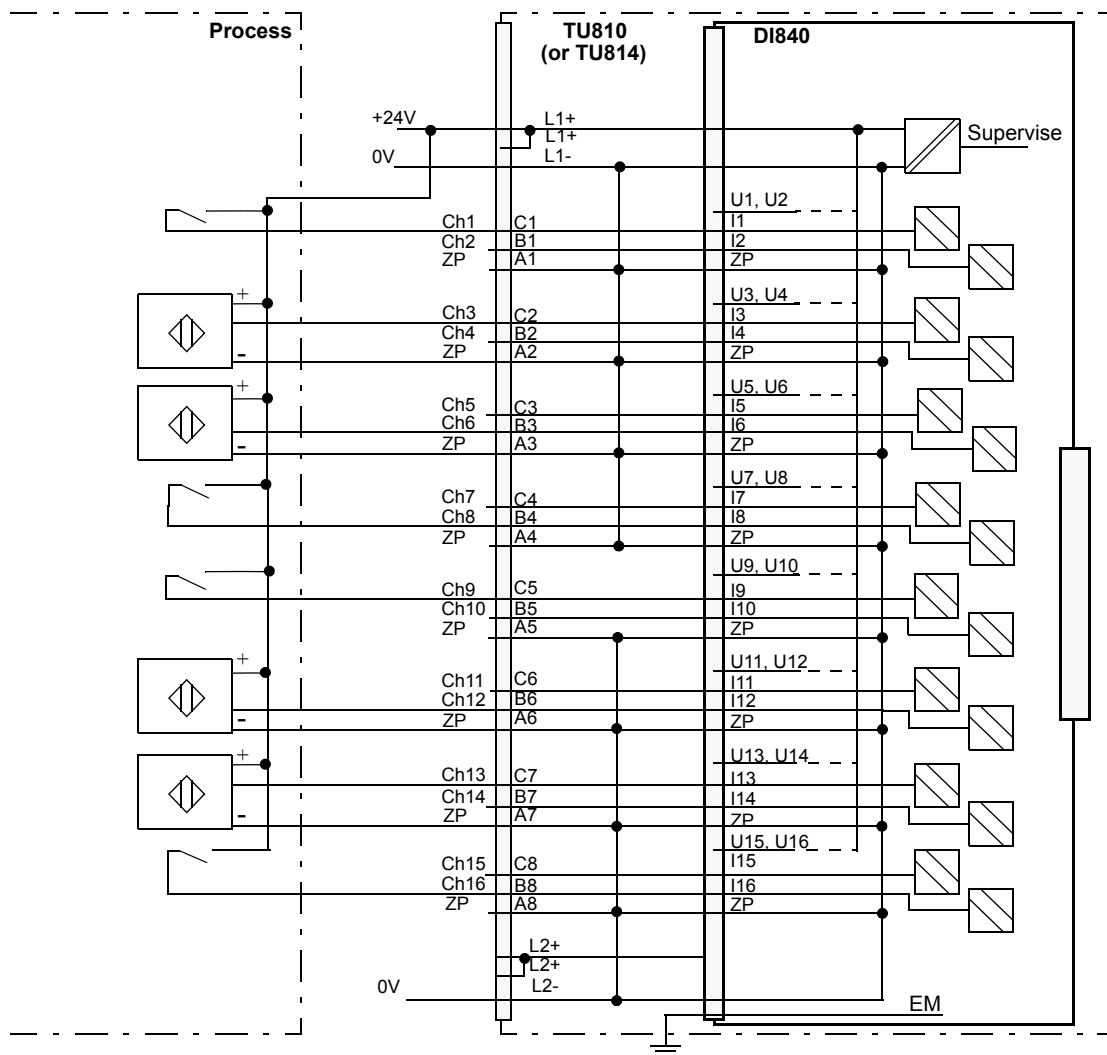


Figure 152. DI840 with TU810 or TU814 Compact MTU Process Connections

Figure 153 shows the process connections for the Digital Input Module DI840 when installed on a TU812 Compact MTU.

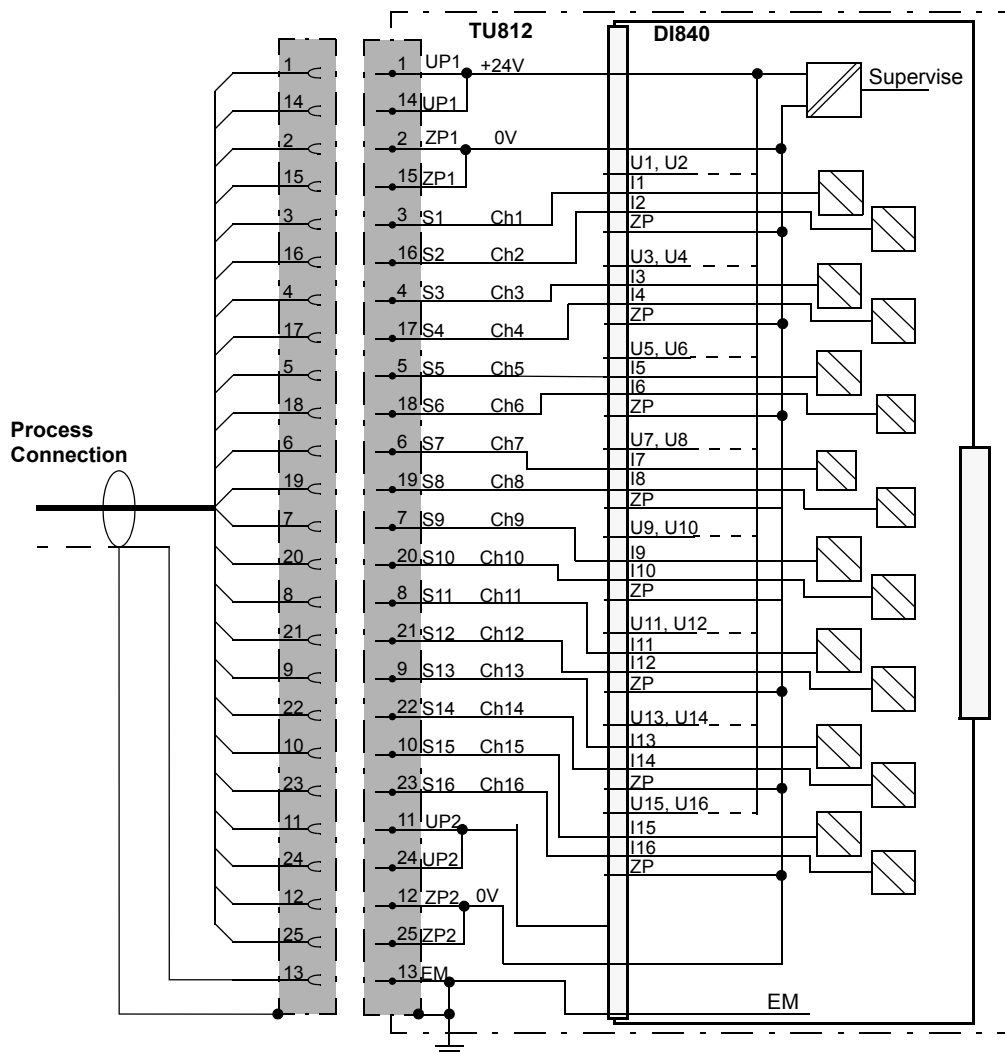


Figure 153. DI840 with TU812 Compact MTU Process Connections

Figure 154 shows the process connections for the Digital Input Module DI840 when installed on a TU818 Compact MTU.

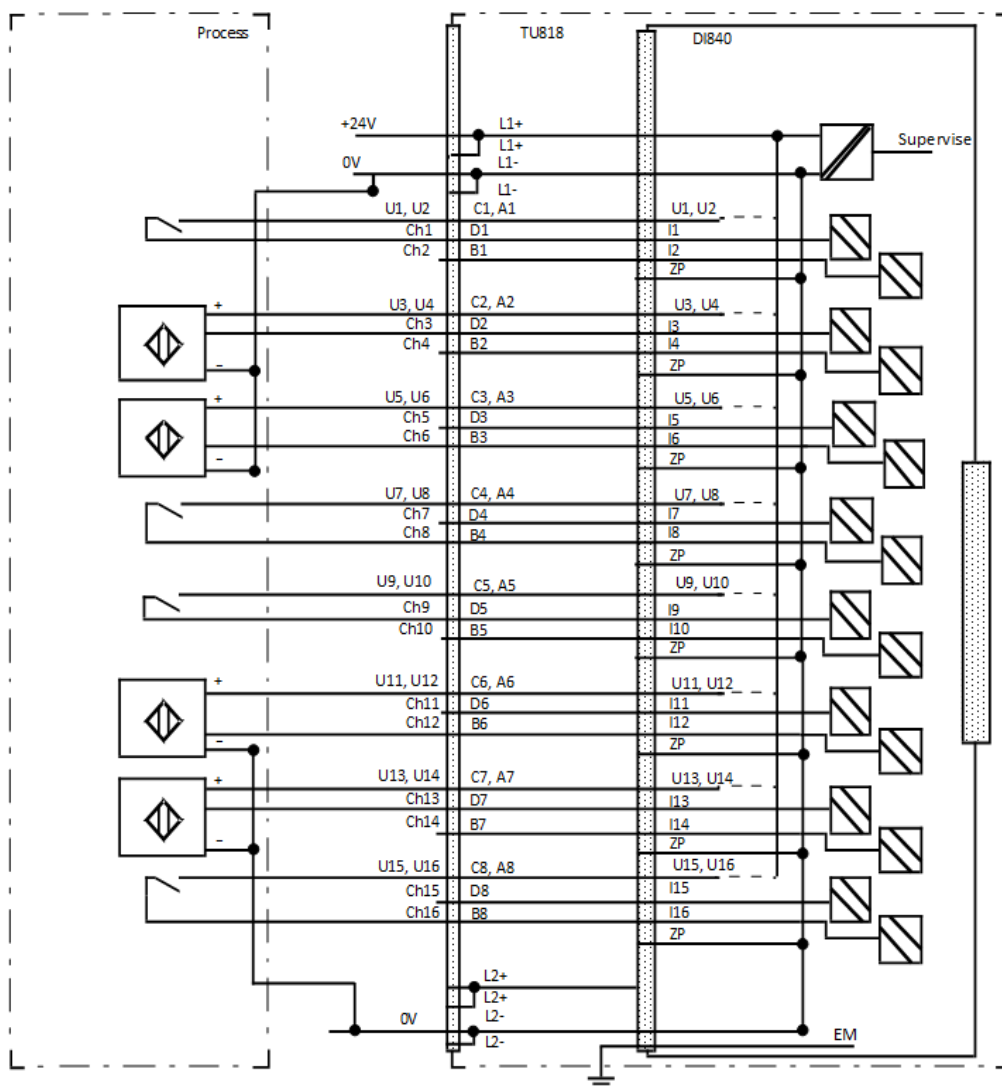


Figure 154. DI840 with TU818 Compact MTU Process Connections

Figure 155 shows the process connections for the Digital Input Module DI840 when installed on a TU842 and TU843 Redundant MTU.

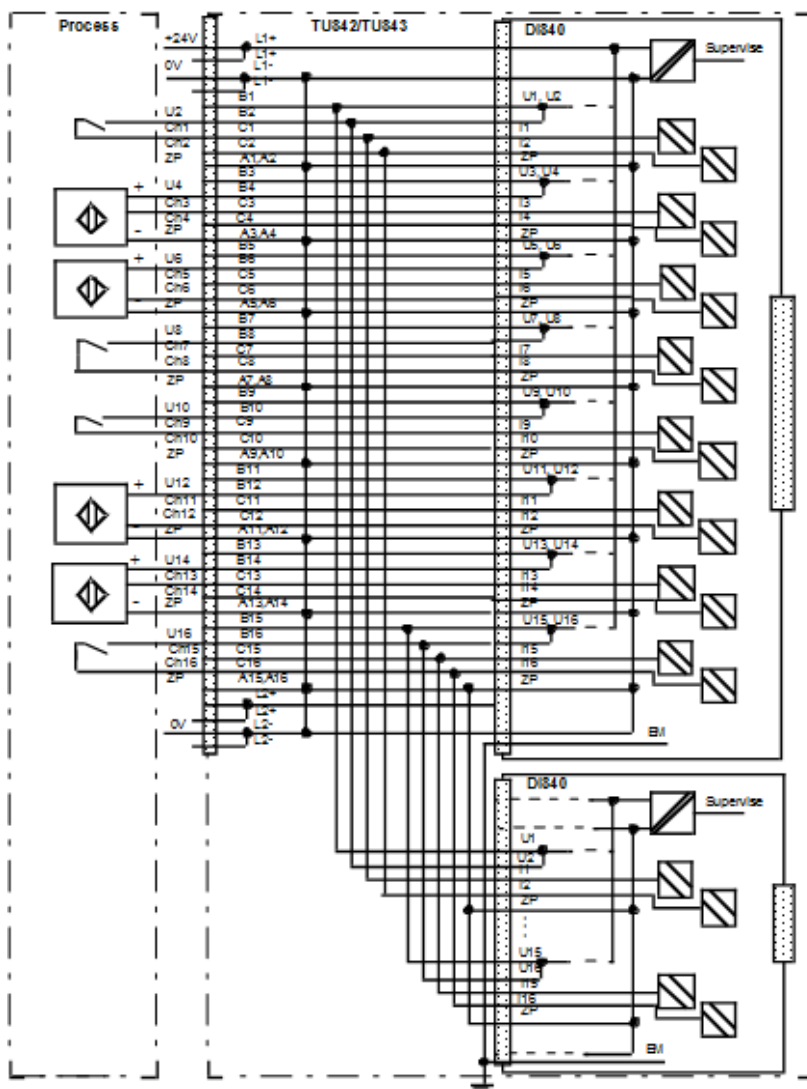


Figure 155. DI840 with TU842 or TU843 Redundant MTU Process Connections

Figure 156 shows the process connections for the Digital Input Module DI840 when installed on a TU852 Redundant Horizontal Dual MTU.

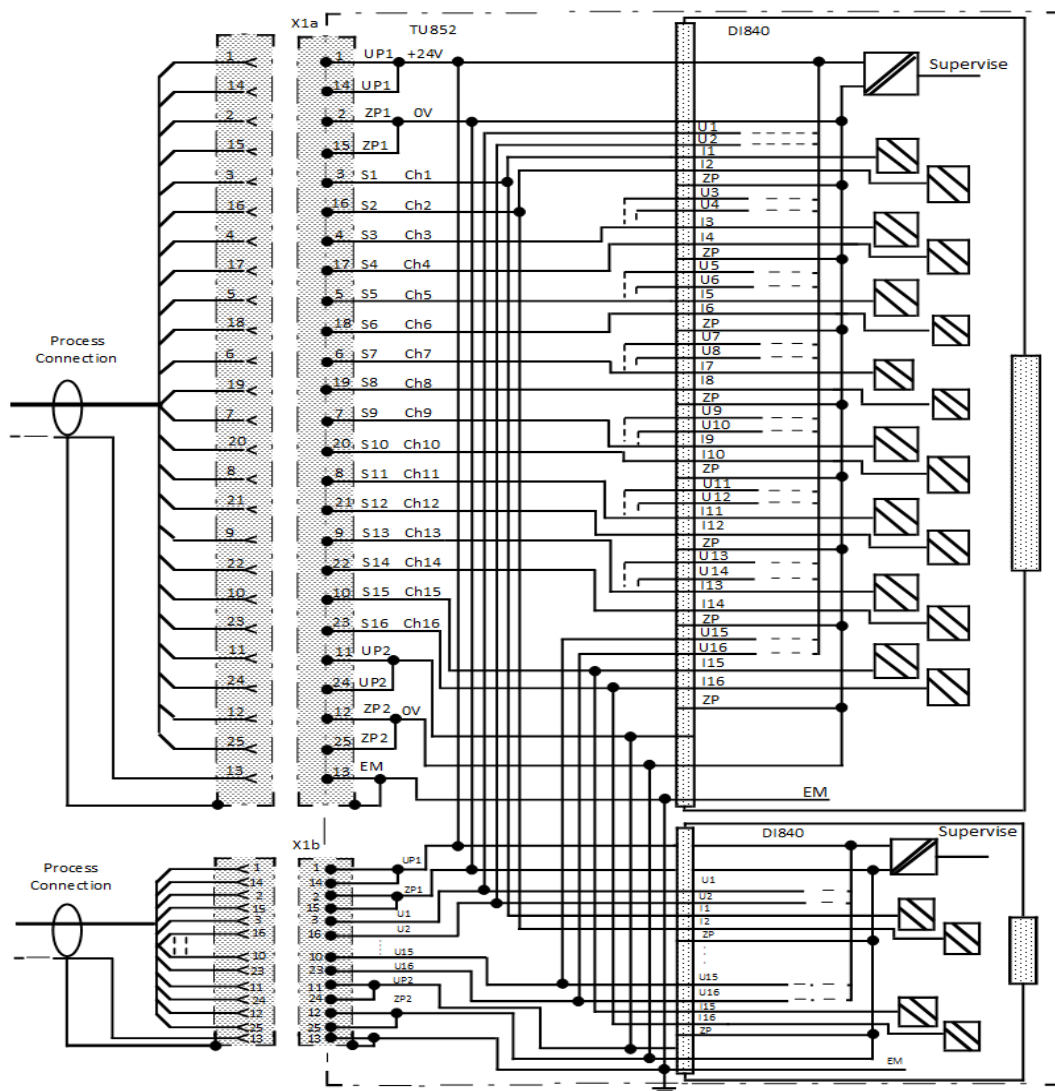


Figure 156. DI840 with TU852 Redundant Horizontal Dual MTU Process Connections

## DI880 High Integrity Digital Input Module

### Features

- 16 channels for 24 V d.c. inputs with current sinking.
- Redundant or single configuration.
- 1 group of 16 isolated from ground.
- Input status indicators.
- Advanced on-board diagnostics.
- Sequence of events (SOE).
- Current limited sensor supply per channel.
- Certified for SIL3 according to IEC 61508.
- Certified for Category 4 according to EN 954-1.

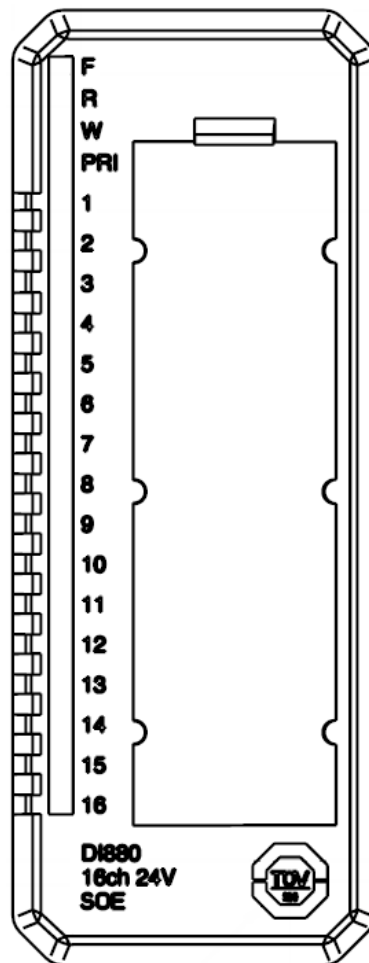
### Description

The DI880 is a 16 channel 24 V d.c. digital input module for single or redundant configuration. The input voltage range is 18 to 30 V d.c. and the input current is 7 mA at 24 V d.c.

Each input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

There is one current limited transducer power output per input.

The Sequence of Event function (SOE) can collect events with a resolution of 1 ms. The event queue can contain up to 512 x 16 events. The function include a Shutter filter for suppression of unwanted events.





The SOE function can report the following status in the event message – Channel value, Queue full, Synchronization jitter, Uncertain time, Shutter filter active and Channel error.

The input signals can be digitally filtered. The filter is selectable from 0 to 127 ms. This means that pulses shorter than the filter time will be filtered out and pulses longer than specified will get through the filter.

Six different types of MTUs can be used for single applications. The Extended MTU (for example TU830/TU833) enables three wire connection to the sensors without additional terminals. The Compact MTU (for example TU810, TU814) has terminals for process voltage supervision inputs, but requires external terminals for distribution of process power supply to the sensors. The TU818 Compact MTU provides connection to 2-wire sensors without external marshaling. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant applications there are three types of MTUs, TU842/TU852 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

Shielded field cables are required for process connections (over all shield is sufficient if a multi core cable contains sorted signal types). It is recommended to feed all sensors connected to DI880 from the current limited sensor power supplies that are supplied by DI880, to fulfill this TU830, TU833, TU842, TU843 or TU852 should be used. If single Compact MTUs (TU810, TU812, TU814 or TU818) are used, refer to the *Technical Description 3BSE050455*.

### **Self-diagnostic Functions**

The module cyclically performs comprehensive self-diagnostics. The detected failures are grouped and reported as described below:

- Errors in External power supply are reported as External error.
- Errors in circuits only affecting specific channels on the module (short circuits, open circuits, stuck-at faults) are reported as Internal channel error.
- Errors in internal power supplies, Errors in micro controller, FPGA and Memory are reported as Module Error.

**Technical Data***Table 71. DI880 High Integrity Digital Input Module Specifications*

<b>Feature</b>	<b>DI880 Digital Input Module</b>
Number of channels	16, current sinking
Rated voltage (Process power supply range)	24 V d.c. (19.2 to 30 V)
Input voltage range, "1"	11 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	7 mA @ 24 V d.c.
Input current, "1"	> 3 mA
Input current, "0"	< 1.5 mA
Input impedance	3.1 kΩ
Maximum field cable length	600 m (656 yd.)
Filter times (digital, selectable)	0 to 127 ms
Shutter filter: Shutter period  Shutter trigger Recovery time	1 - 255 s (default 0, means deactivated filter) 1...255 changes (default 4) 0 - 65535 s (default 0, means deactivated filter)
Event recording resolution	1 ms
Sensor supply (per channel)	Voltage: Process power supply (UPx) - max 4.2 V Current: 32 mA, +/- 10%
Current consumption 5 V (Modulebus)	125 mA (typ) 150 mA (max)
Current consumption 24 V (process power supply, UPx)	527 mA (max) (15 mA + sensor current)

Table 71. DI880 High Integrity Digital Input Module Specifications (Continued)

Feature	DI880 Digital Input Module
Power dissipation	2.4 W
Isolation	Yes, opto
Mounting termination units	TU810, TU812, TU814, TU818, TU830, TU833, TU842, TU843 and TU852
MTU keying code	FF
Event recording accuracy	-0 ms / +1.3 ms
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

Block Diagram DI880

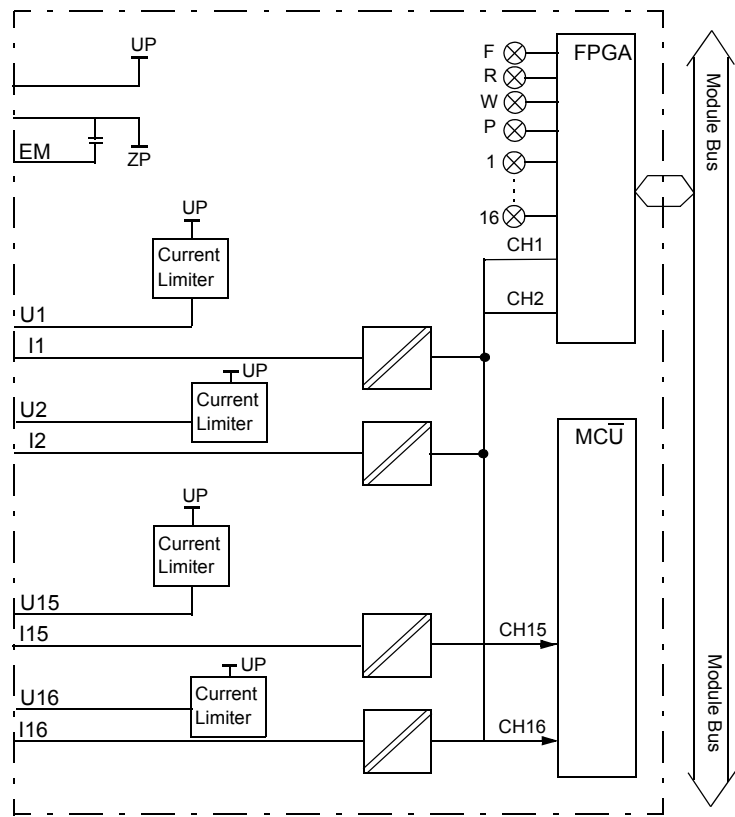


Figure 157. DI880 Block Diagram

**Process Connections**

Shielded cables<sup>B</sup> should be used for process connections (over all shield is sufficient if a multi core cable contains sorted signal types).

Table 72. DI880 Process Connections

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830/ TU833 Terminal	TU842 TU843 Terminal	TU852 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+	1, 14 (X1a and X1b)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1-	2, 15 (X1a and X1b)
U1, U2	-	-	C1, A1	B1, B2	B1, B2	3, 16 (X1b)
Ch1 Input	C1	3	D1	C1	C1	3 (X1a)
Ch 2 Input	B1	16	B1	C2	C2	16 (X1a)
Ch1/Ch2, L1-	A1	-	-	A1, A2	A1, A2	-
U3, U4	-	-	C2, A2	B3, B4	B3, B4	4, 17 (X1b)
Ch 3 Input	C2	4	D2	C3	C3	4 (X1a)
Ch 4 Input	B2	17	B2	C4	C4	17 (X1a)
Ch 3/Ch 4, L1-	A2	-	-	A3, A4	A3, A4	-
U5, U6	-	-	C3, A3	B5, B6	B5, B6	5, 18 (X1b)
Ch 5 Input	C3	5	D3	C5	C5	5 (X1a)
Ch 6 Input	B3	18	B3	C6	C6	18 (X1a)
Ch 5/Ch 6, L1-	A3	-	-	A5, A6	A5, A6	-

B. For use without shielded cables, see Technical Description 3BSE070238

Table 72. DI880 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector <sup>(1)</sup>	TU818 Terminal	TU830/ TU833 Terminal	TU842 TU843 Terminal	TU852 Terminal
U7, U8	-	-	C4, A4	B7, B8	B7, B8	6, 19 (X1b)
Ch 7 Input	C4	6	D4	C7	C7	6 (X1a)
Ch 8 Input	B4	19	B4	C8	C8	19 (X1a)
Ch 7/Ch8, L1-	A4	-	-	A7, A8	A7, A8	-
U9, U10	-	-	C5, A5	B9, B10	B9, B10	7, 20 (X1b)
Ch 9 Input	C5	7	D5	C9	C9	7 (X1a)
Ch 10 Input	B5	20	B5	C10	C10	20 (X1a)
Ch 9/Ch 10, L2-	A5	-	-	A9, A10	A9, A10	-
U11, U12	-	-	C6, A6	B11, B12	B11, B12	8, 21 (X1b)
Ch 11 Input	C6	8	D6	C11	C11	8 (X1a)
Ch 12 Input	B6	21	B6	C12	C12	21 (X1a)
Ch 11/Ch 12, L2-	A6	-	-	A11, A12	A11, A12	-
U13, U14	-	-	C7, A7	B13, B14	B13, B14	9, 22 (X1b)
Ch 13 Input	C7	9	D7	C13	C13	9 (X1a)
Ch 14 Input	B7	22	B7	C14	C14	22 (X1a)
Ch 13/Ch 14, L2-	A7	-	-	A13, A14	A13, A14	-
U15, U16	-	-	C8, A8	B15, B16	B15, B16	10, 23 (X1a)
Ch 15 Input	C8	10	D8	C15	C15	10 (X1a)

Table 72. DI880 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector <sup>(1)</sup>	TU818 Terminal	TU830/ TU833 Terminal	TU842 TU843 Terminal	TU852 Terminal
Ch 16 Input	B8	23	B8	C16	C16	23 (X1a)
Ch 15/Ch16, L2-	A8	-	-	A15, A16	A15, A16	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+	11, 24 (X1a and X1b)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2-	12, 25 (X1a and X1b)

(1) Pin 13 connected to connector body for EM.

Figure 158 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU830 Extended MTU.

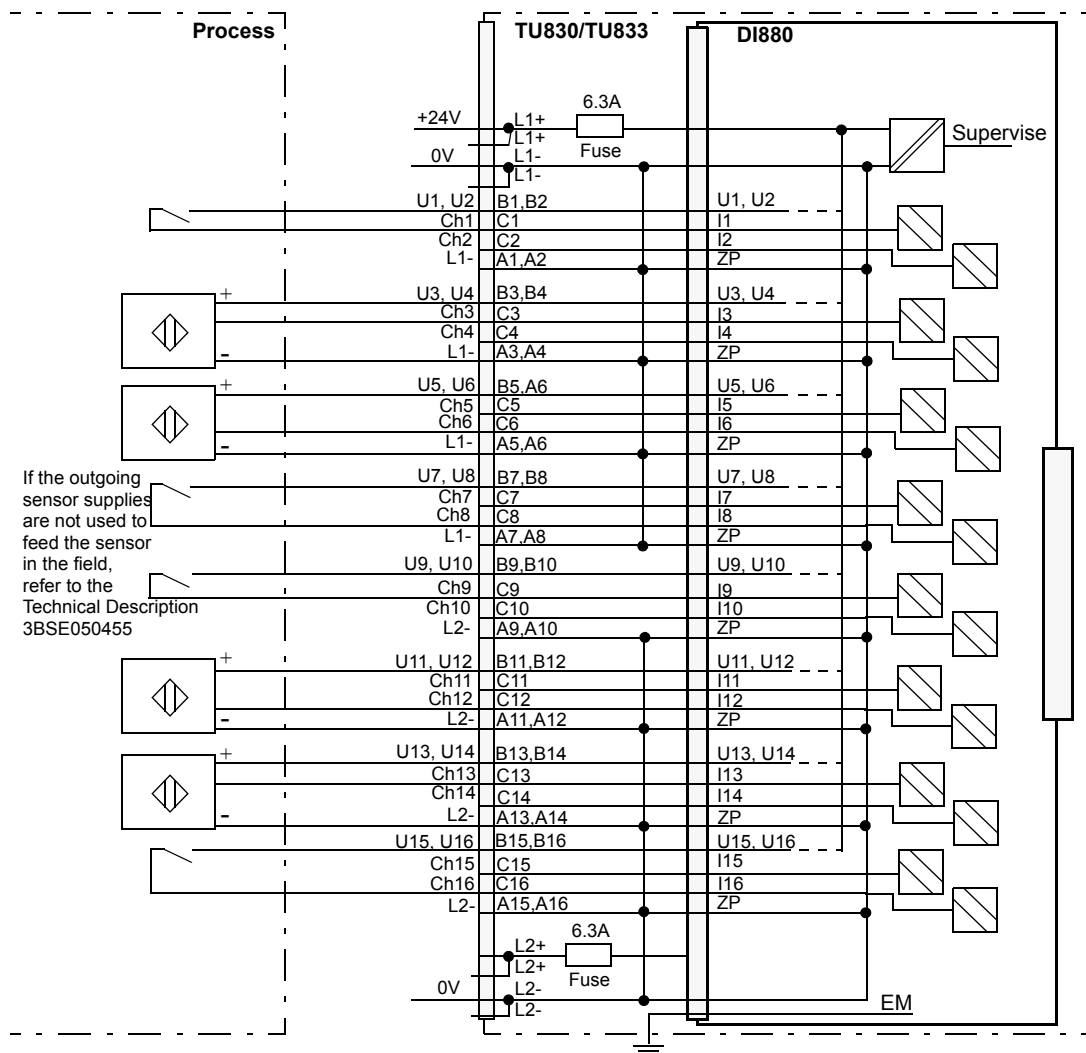


Figure 158. DI880 with TU830 Extended MTU Process Connections



Figure 159 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU810 or TU814 Compact MTU.

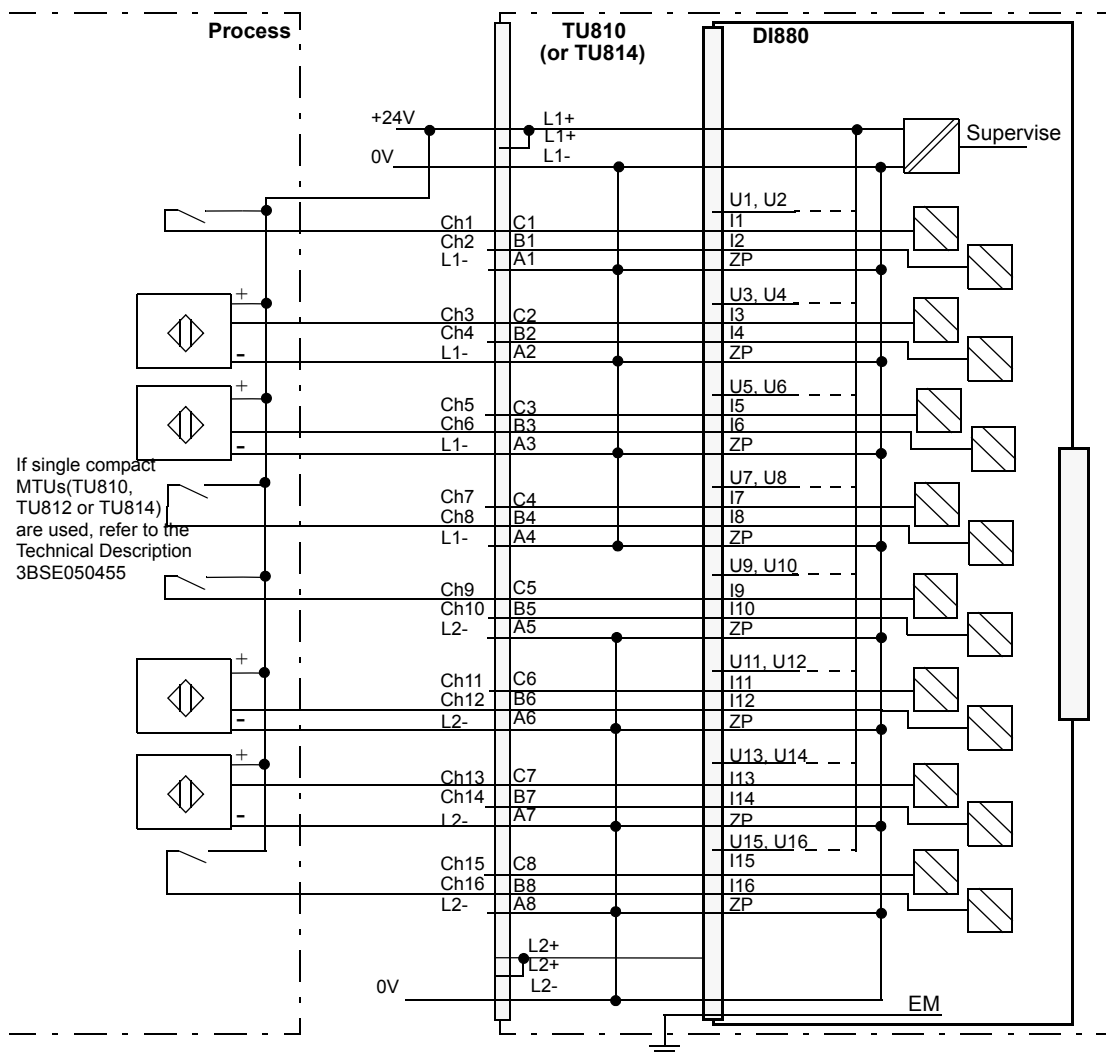


Figure 159. DI880 with TU810 or TU814 Compact MTU Process Connections

Figure 160 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU812 Compact MTU.

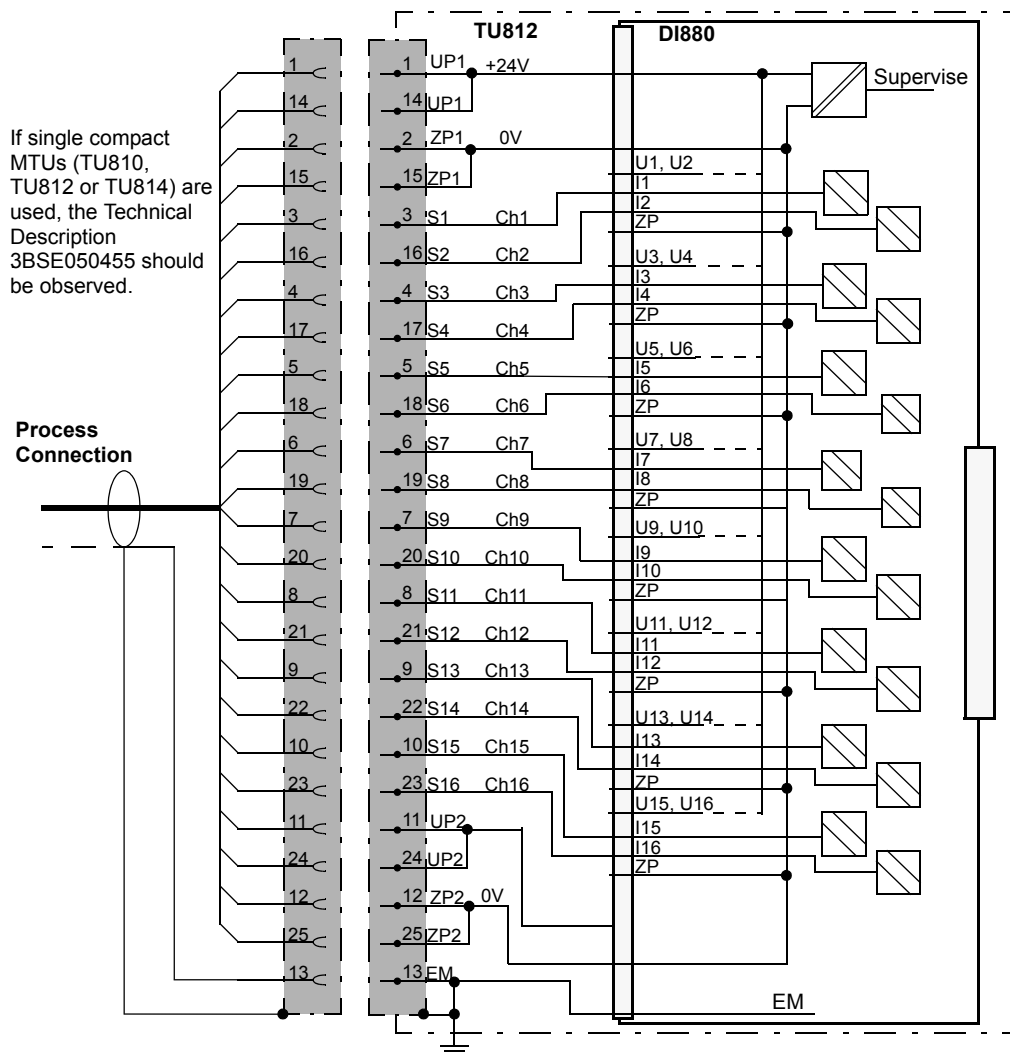


Figure 160. DI880 with TU812 Compact MTU Process Connections

Figure 161 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU842 or TU843 Redundant MTU.

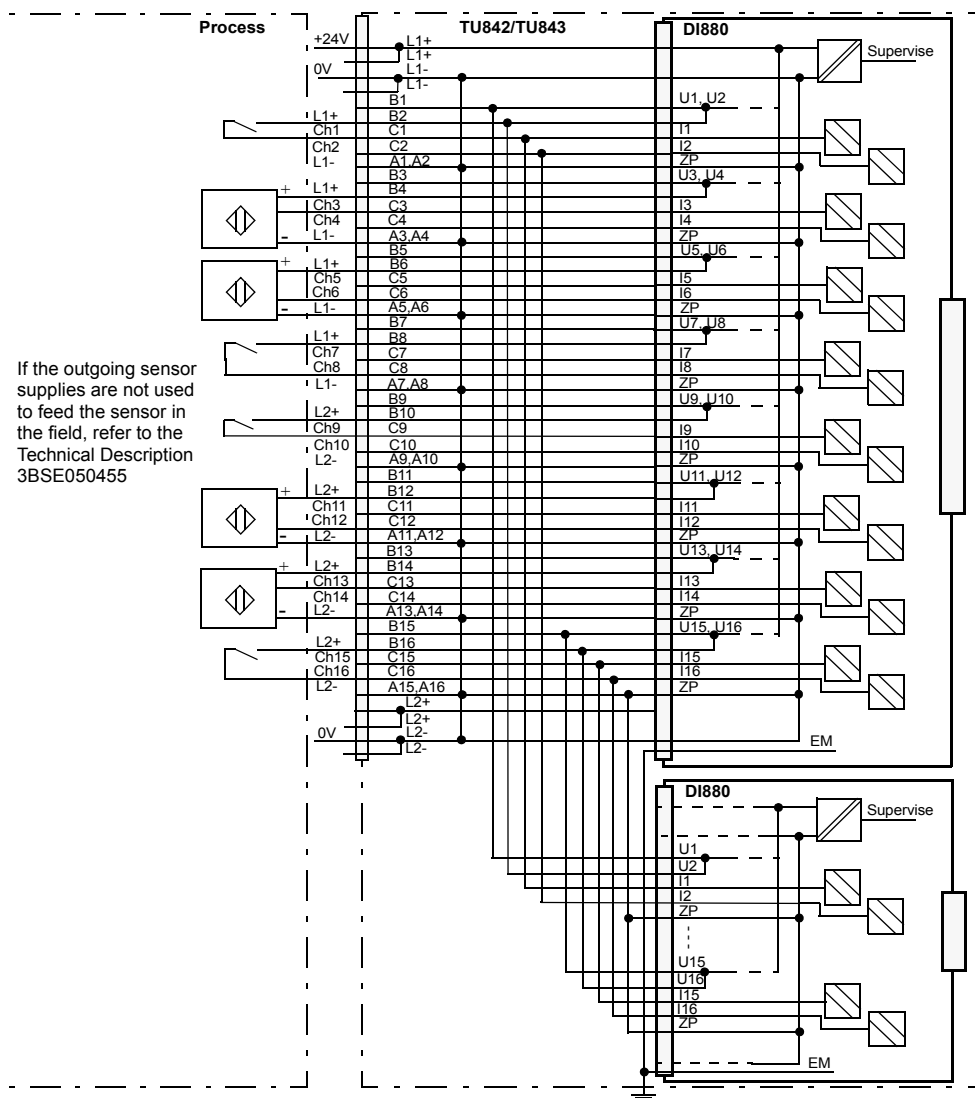


Figure 161. DI880 with TU842 or TU843 Redundant MTU Process Connections

Figure 162 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU818 Compact MTU.

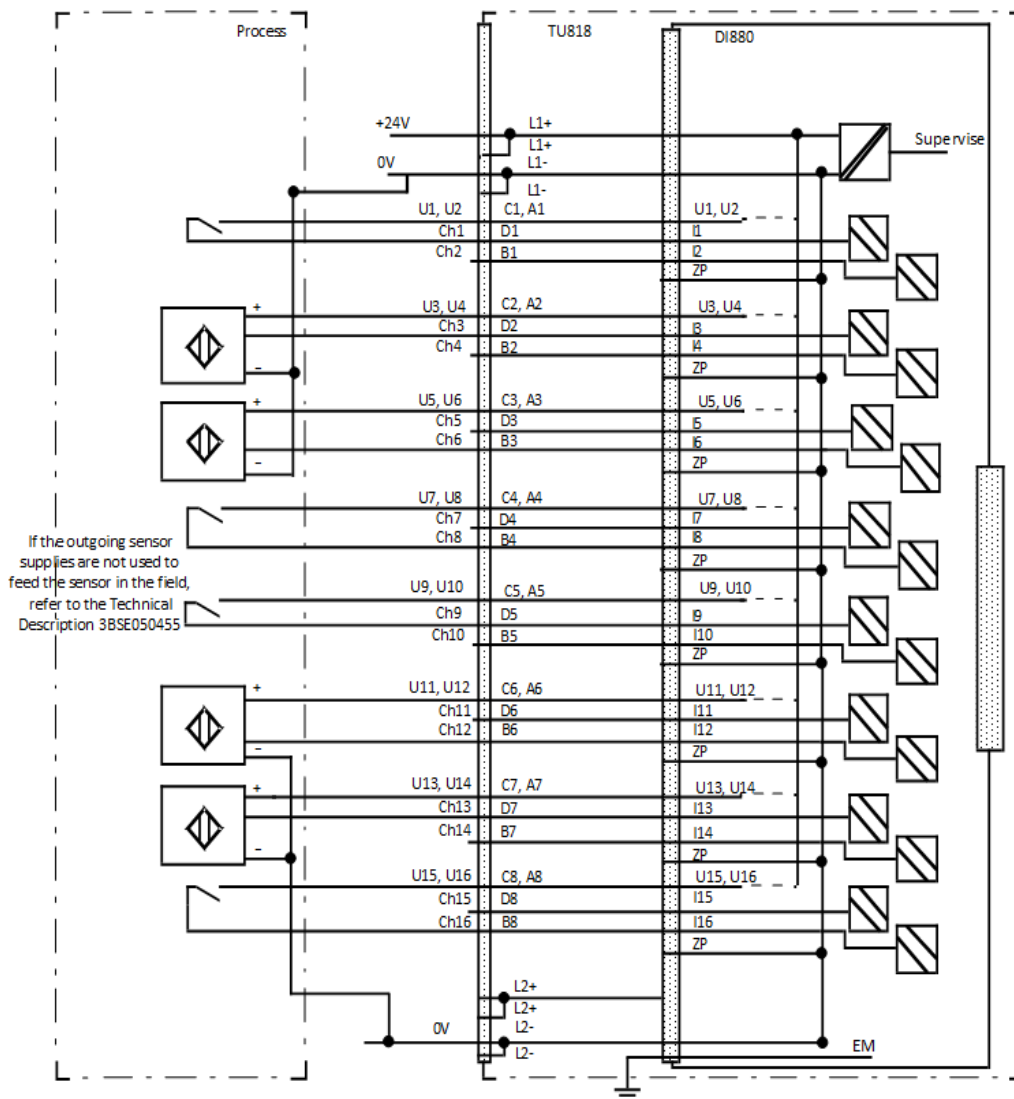


Figure 162. DI880 with TU818 Compact MTU Process Connections

Figure 163 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU852 Redundant Horizontal Dual MTU.

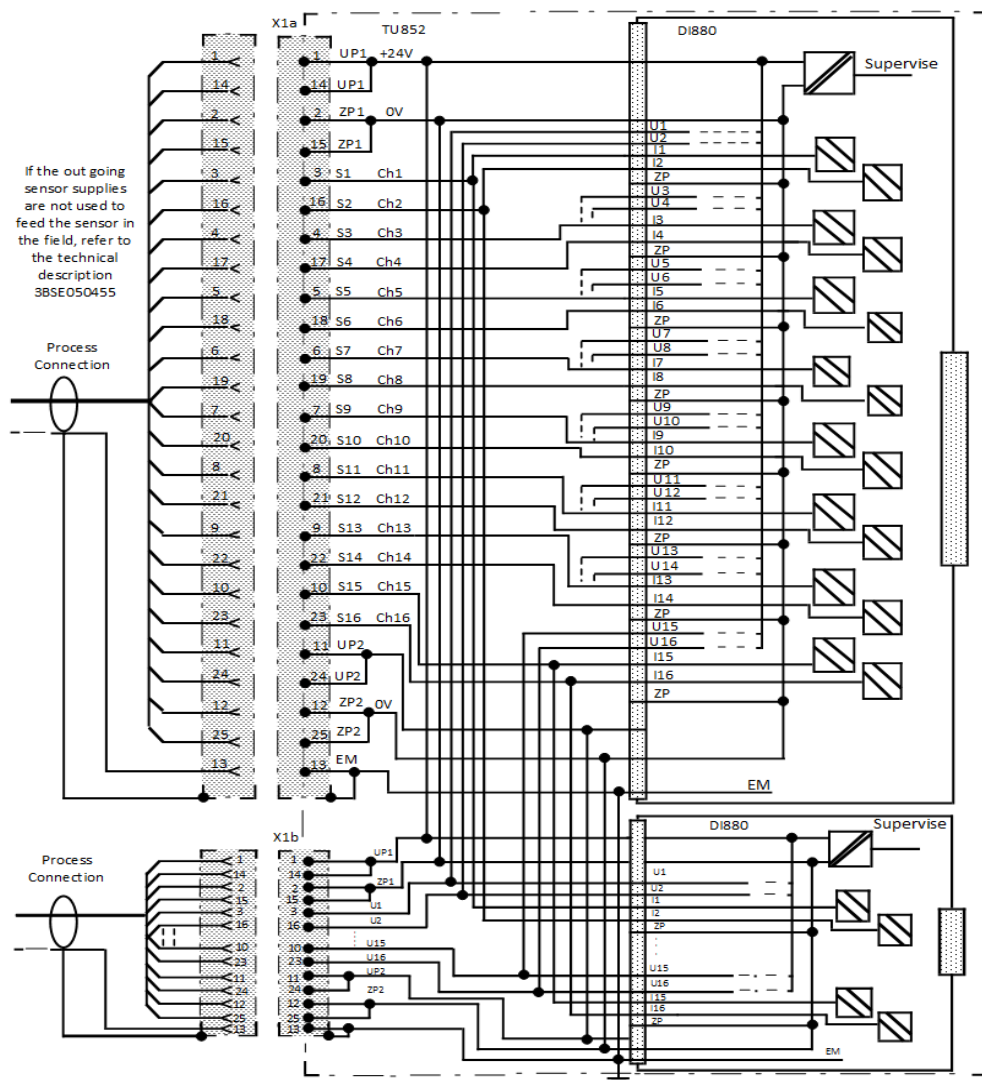


Figure 163. DI880 with TU852 Redundant Horizontal Dual MTU Process Connections

## DI885 Digital Input Module, 24 V /48 V d.c. with SOE, Current Sinking

### Features

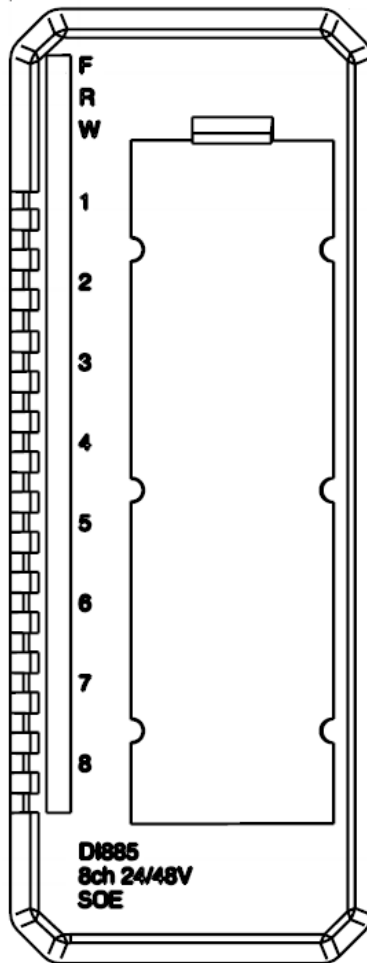
- 8 channels for 24/48 V d.c. inputs with current sinking.
- Input status indicators.
- Sequence of event (SOE) functionality.
- External 24 or 48 V d.c. sensor power supply.
- Internal 48 V d.c. sensor power supply.
- Short circuit protection to ground and 48 Volt.
- Channel supervision.
- Sensor power supply supervision.
- Shutter filter.

### Description

The DI885 is a 8 channel 24/48 V digital input module for the S800 I/O. This module has 8 digital inputs. The input voltage range is 11.8 - 60 V d.c. and the input current is 1.6 mA at 24 V d.c., (3.2 mA at 48 V d.c.).

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

The sensor power supply supervision gives an error signal if the voltage disappears, and the Warning LED turns on. The error signal can be read through the ModuleBus.



The input signals of the input module DI885 can be filtered to suppress any electrical interference or contact bounce. The filter time can be set to a range 0 to 255 ms. This means that noise pulses shorter than the filter time are filtered out and pulses longer than specified filter time get through the filter.

Six different types of MTUs can be used. The TU830/TU833 Extended MTU and the TU810 (TU814) Compact MTU has terminals for process voltage inputs and three terminals per channel. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. The TU818 Compact MTU provides connection to 2-wire sensors without external marshaling.

### **Event Recording**

The DI885 Input Module can be used for event recording (SOE), that is, changing signals at digital input channels can be announced together with a time stamp indicating when it occurred. The time stamp has a resolution of 1 millisecond, and is compensated for the filter time.

The module has intermediate storage for 32 events.

The SOE functionality can be switched on and off per channel.

For all channels with enabled SOE capability, a shutter filter is implemented that prevents intermediate storage for events from overflow. The shutter filter is closed as soon as the number of events generated within the shutter period (0-255 seconds) exceeds the shutter trigger number (0-255 changes). The shutter filter remains closed as long as the recovery time (0-65535 seconds) has not expired.

### **Simple Digital Input**

If no event recording is used, the DI885 acts like a simple digital input device.

### **Channel Supervision**

The DI885 is able to supervise the process channel regarding wire break of sensor cable, missing sensor and short circuit of sensor voltage to module ground.

The supervision can be switched on and off per device. The channel supervision is only possible when the contact is equipped with a parallel resistor of  $47\text{ k}\Omega \pm 20\%$ , and 48 V sensor power.

### Sensor Power Supply and Supervision

The DI885 provides a 48 V d.c. sensor power supply per device.

The DC/DC - converter for 48 V d.c. supply can be powered from the internal 24 V d.c. provided by the ModuleBus or from an external source.

The power supply is short-circuit proof and galvanically insulated.

It is also possible to supply the sensors with an external 48 V d.c. power supply. In this case the internal voltage path is switched off.

### Supported Sensor Types

The following sensor types are supported by the DI885.

- **Dry Contacts supervised: 48 V d.c./ 3,2 mA**

The supervision is only possible for contacts with resistor connected in parallel. Supervision is always available within internal sensor power supply. Supervision in connection with external sensor power supply requires the same strict limits in the tolerances of the external supply voltage as for internal supply voltage (48 V d.c.  $\pm 10\%$ )

- **Dry Contacts not supervised with external Power Supply:  $\geq 60$  V d.c./ max. 4 mA**

The maximum input voltage of 60 V DC must be kept strictly.

- **Electronic Inputs not supervised: 24 V d.c./ 1.6 mA**

Only in combination with external power supply.

- **Open Collector Drivers (Current sourcing) not supervised: 24 V DC / 1.6 mA**

Only in combination with external power supply.



## Technical Data

Table 73. DI885 Digital Input Module Specifications

Feature	DI885 Digital Input Module
Number of channels	8, current sinking
Power supply: Nominal voltage Operating voltage range	24 V d.c. 19.2 to 30 V d.c.
Process Power supply: (UP) Nominal voltage with internal supply Voltage range with external supply	48 V d.c. +/- 10% 18 V d.c. - 60 V d.c.
Input signal 48 V contact supervised	"1": >30 V d.c....<60 V d.c. (>2 mA...<4 mA) "0": <23 V d.c....>8 V d.c. (<1.5 mA...>0.5 mA) Open circuit: <5 V (<0.33 mA)
Input signal 48 V contact not supervised	"1": >30 V d.c....<60 V d.c. (>2 mA...<4 mA) "0": <23 V d.c....>-30 V d.c. (<1.5 mA...>-2.2 mA)
Input signal 24 V electronic not supervised	"1": >8 V d.c....<60 V d.c. (>0.5 mA...<4 mA) "0": <5 V d.c....>-30 V d.c. (<0.33 mA...>-2.2 mA)
Input impedance	15 kOhm
Maximum field cable length	600 meters, (656 yd.)
Bounce filter times (digital, selectable)	0 to 255 ms
Event recording resolution	1 ms
Event recording accuracy	-0.5 ms to +1.3 ms

Table 73. DI885 Digital Input Module Specifications (Continued)

Feature	DI885 Digital Input Module
Shutter filter Shutter period Shutter trigger Recovery time	0... 255 s 0.. 255 changes 0... 65535 s
Process voltage supervision	per device
Current consumption 5 V (Modulebus)	160 mA
Current consumption 24 V (Modulebus)	91 mA
Current consumption 24 V (process power supply, UPx)	91 mA
Current consumption 48 V (process power supply, UPx)	22 mA
Power dissipation <sup>(1)</sup>	3 W
Isolation	Yes, opto
Module termination units	TU810, TU812, TU814, TU818, TU830 or TU833
MTU keying code	BF
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24/48 Volts.

Block Diagram DI885

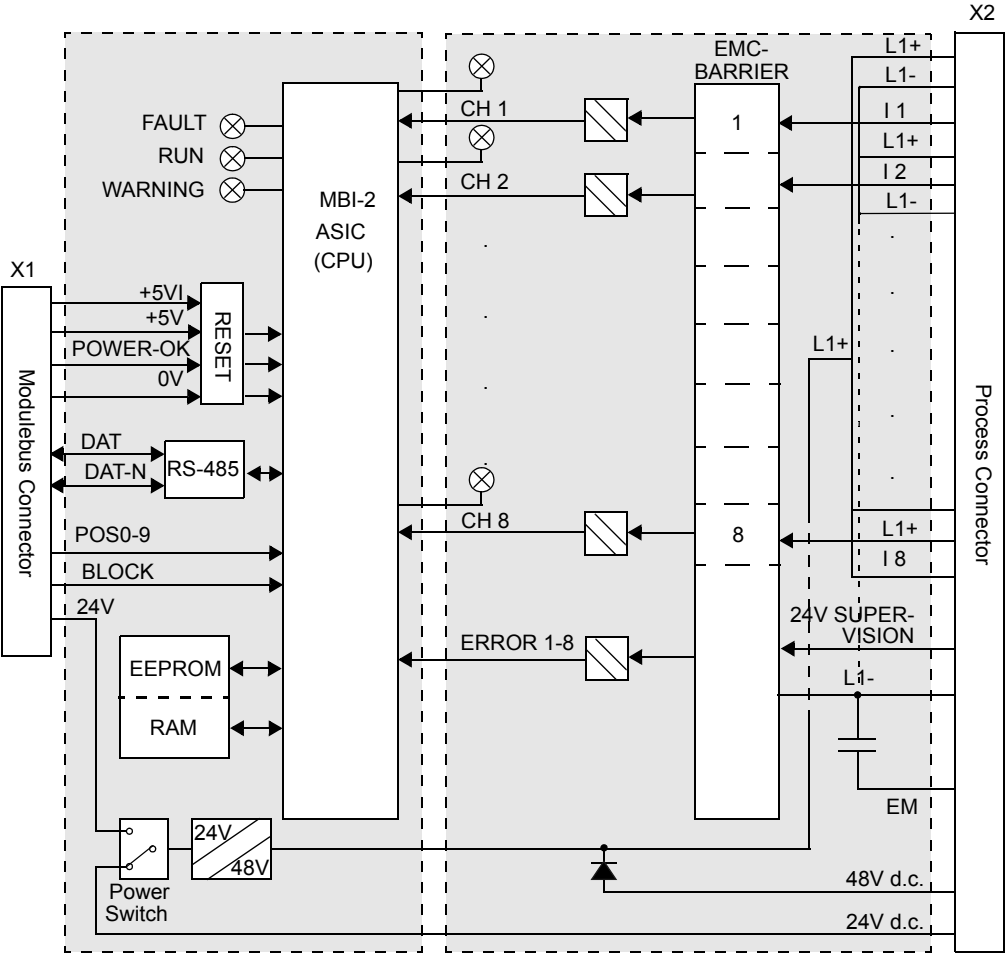


Figure 164. DI885 Block Diagram

## Process Connections

Table 74. DI885 Process Connections

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU818 Terminal	TU830/TU833 Terminal
+24 V d.c. ext.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-, L2-	2, 15	L1- (2), L2- (2)	L1- (2), L2- (2)
Ch1 +48 V	B1	16	B1	C2
Ch1 Input	C1	3	D1	C1
Ch 2 +48 V	B2	17	B2	C4
Ch 2 Input	C2	4	D2	C3
Ch 3 +48 V	B3	18	B3	C6
Ch 3 Input	C3	5	D3	C5
Ch 4 +48 V	B4	19	B4	C8
Ch 4 Input	C4	6	D4	C7
Ch 5 +48 V	B5	20	B5	C10
Ch 5 Input	C5	7	D5	C9
Ch 6 +48 V	B6	21	B6	C12
Ch 6 Input	C6	8	D6	C11
Ch 7 +48 V	B7	22	B7	C14
Ch 7 Input	C7	9	D7	C13
Ch 8 +48 V	B8	23	B8	C16
Ch8 Input	C8	10	D8	C15
+48 V ext.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)

(1) Pin 13 connected to connector body for EM.

Figure 165 shows the process connections for the Digital Input Module DI885 when installed on a TU830 Extended MTU.

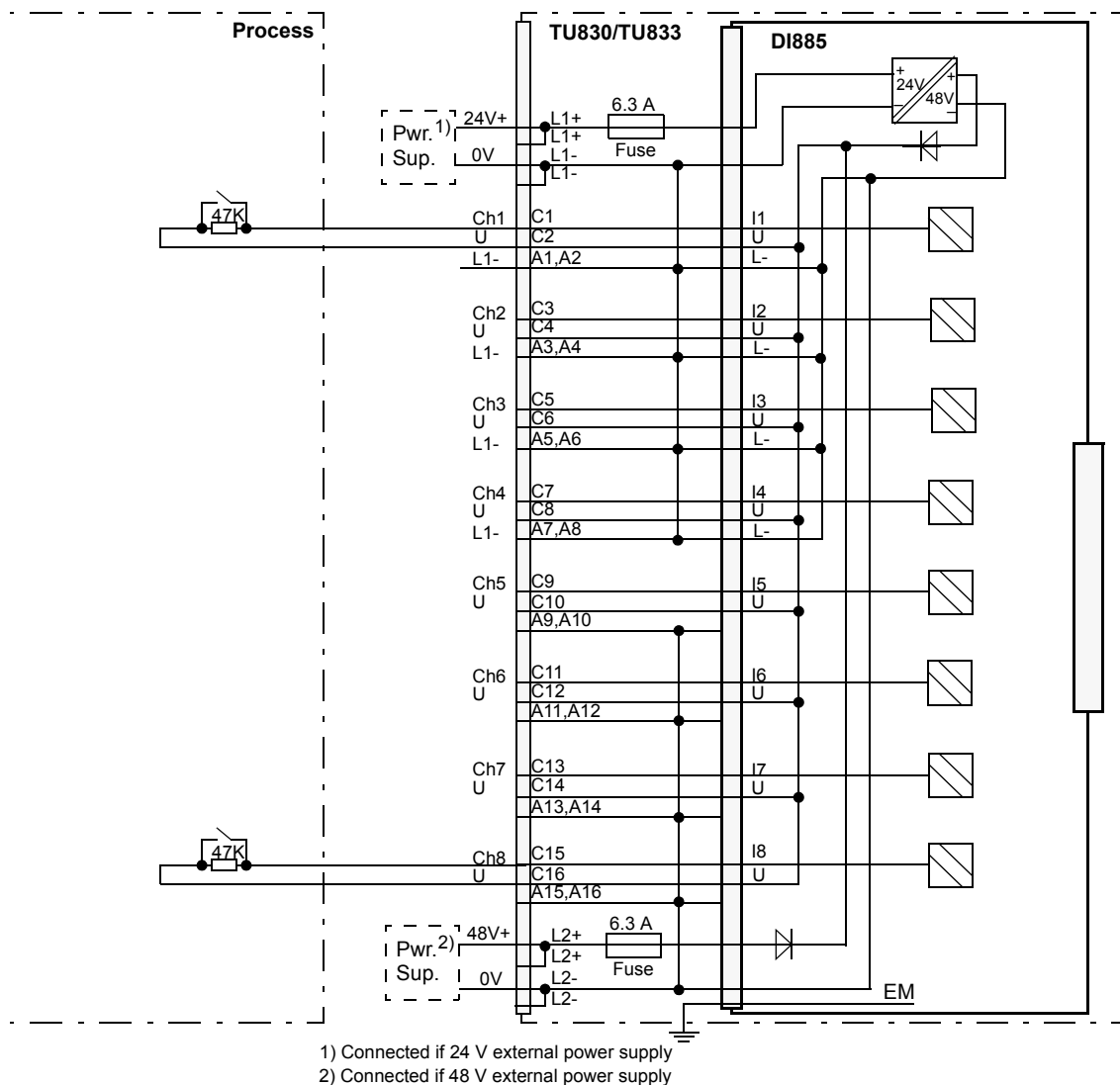


Figure 165. DI885 with TU830 Extended MTU Process Connections

Figure 166 shows the process connections for the DI885 when installed on a TU810 or TU814 Compact MTU.

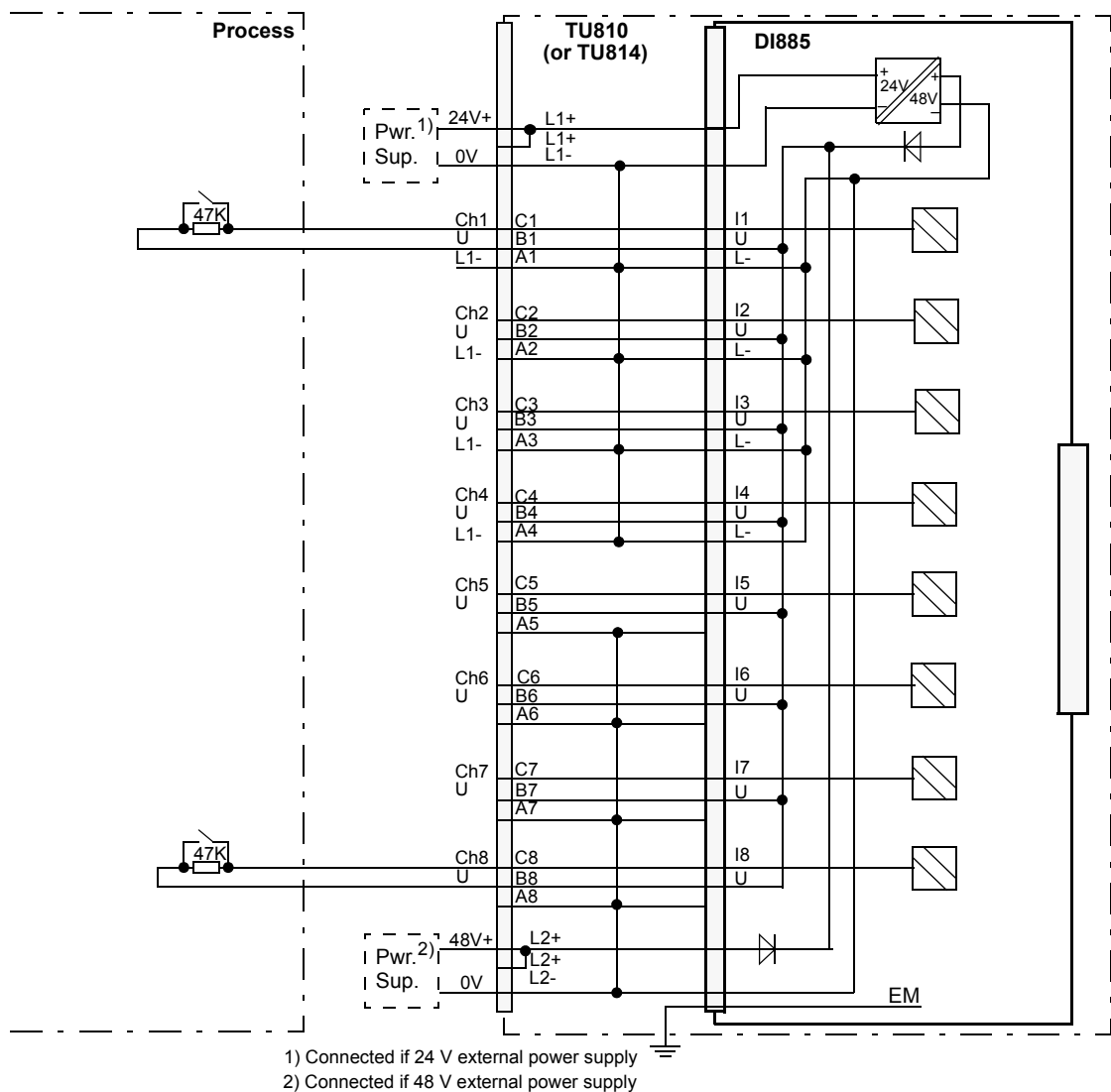


Figure 166. DI885 with TU810 or TU814 Compact MTU Process Connections

387



Figure 168 shows the process connections for the DI885 when installed on TU818 Compact MTU.

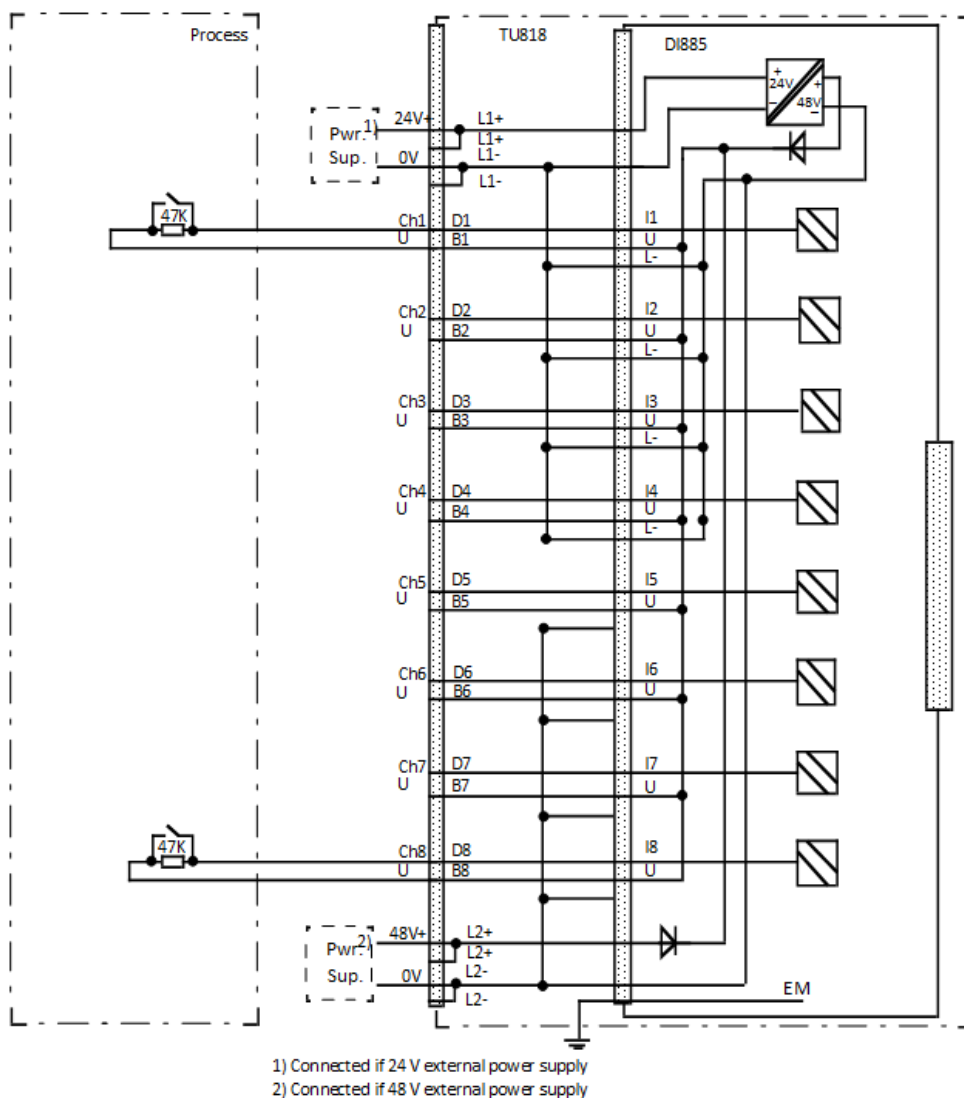


Figure 168. DI885 with TU818 Compact MTU Process Connections



## DO801 Digital Output Module 24 V, 0.5 A, Current Sourcing

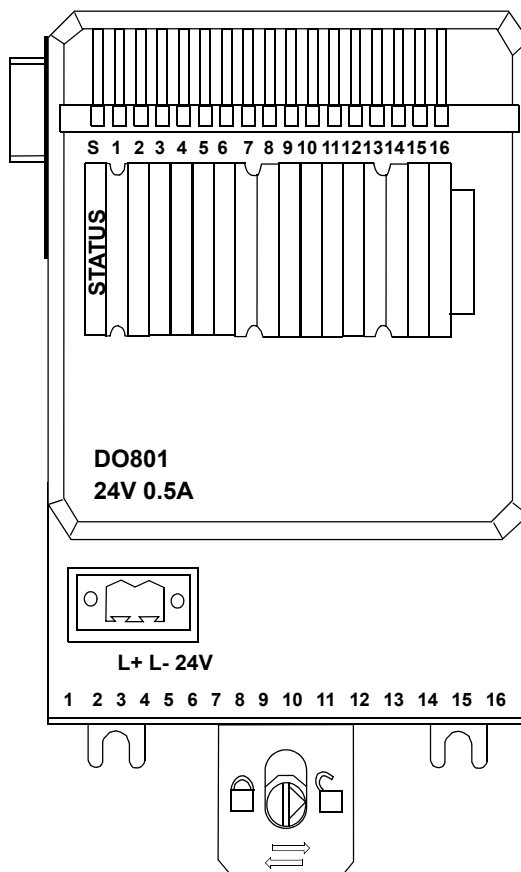
### Features

- 16 channels for 24 V d.c. current sourcing outputs.
- 1 isolated groups of 16 channels.
- Output status indicators.
- OSP sets outputs to predetermined state upon communication error.
- Short-circuit protection to ground and 30 V.
- Over-voltage and over-temperature protection.
- Process and power connection via detachable connectors.

### Description

The DO801 is a 16 channel 24 V digital output module for the S800 I/O. The output voltage range is 10 to 30 volt and the maximum continuous output current is 0.5 A. The outputs are protected against short circuits, over voltage and over temperature. The outputs are in one isolated group.

Each output channel consists of a short circuit and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier.



The outputs are current limited and protected against over temperature. If the outputs are overloaded the output current will be limited. This means that the power dissipation in the output stage will increase and the output will shutdown if the temperature in the output stage increases above 150°C (302°F). The output will switch on again automatically as the component temperature has decreased to about 140°C (284°F). If any output is shutdown due to overload, the indication LED on that channel is not switched off. The output status of that channel cannot be read from the module.

Technical Data

Table 75. DO801 Digital Output Module Specifications

Feature	DO801 Digital Output Module
Number of channels	16 (1 x 16)
Type of output	Transistor current source, current limited
Voltage range	12 - 32 V d.c.
Load current, maximum	0.5 A
Short circuit current, maximum	2.4 A
Leakage current, maximum	<10 µa
Signal delay	<0.2 ms
Output impedance	<0.4 ohm
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption 5 V (Modulebus)	80 mA
Power dissipation <sup>(1)</sup>	2.1 W
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Isolation	Groupwise isolated from ground

Table 75. DO801 Digital Output Module Specifications (Continued)

Feature	DO801 Digital Output Module
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm <sup>2</sup> , 30-12 AWG Stranded: 0.05-1.5mm <sup>2</sup> , 30-12 AWG Recommended torque: 0.5-0.6 Nm Stripping length: 6-7.5 mm, 0.24-0.30 in

(1) Power dissipation is calculated with 70 percent of the channels activated.

Block Diagram DO801

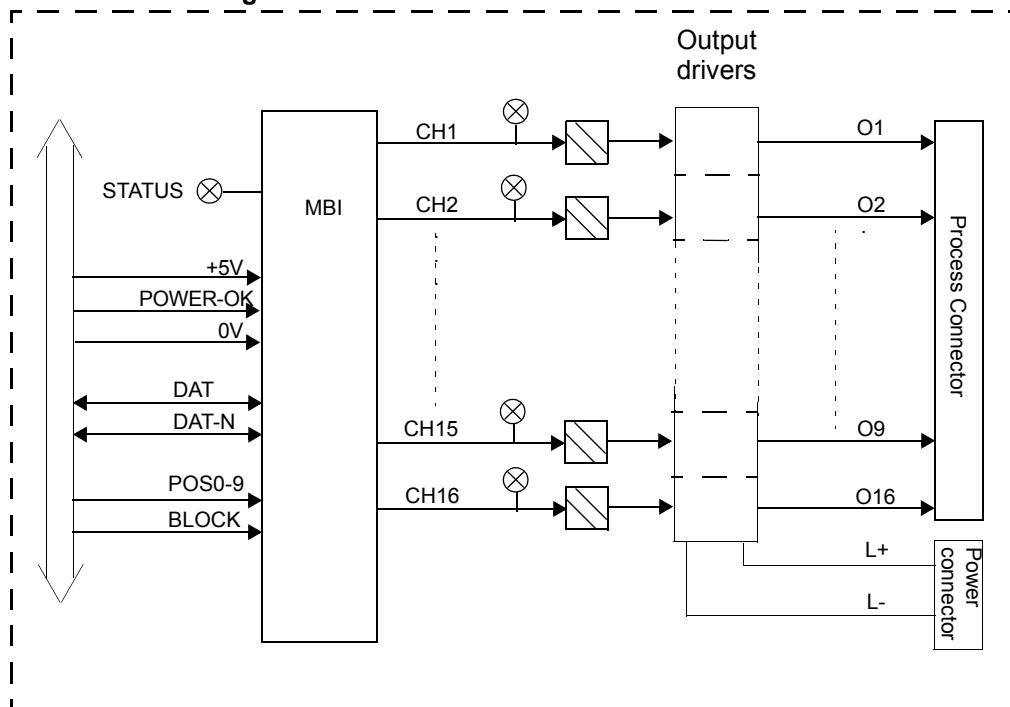


Figure 169. DO801 Block Diagram

Process Connections

Table 76. DO801 Process Connections

Process Connection	Process Terminal
Ch 1 Output	1
Ch 2 Output	2
Ch 3 Output	3
Ch 4 Output	4
Ch 5 Output	5
Ch 6 Output	6
Ch 7 Output	7
Ch 8 Output	8
Ch 9 Output	9
Ch 10 Output	10
Ch 11 Output	11
Ch 12 Output	12
Ch 13 Output	13
Ch 14 Output	14
Ch 15 Output	15
Ch 16 Output	16

Figure 170 shows the process connections for the DO801.

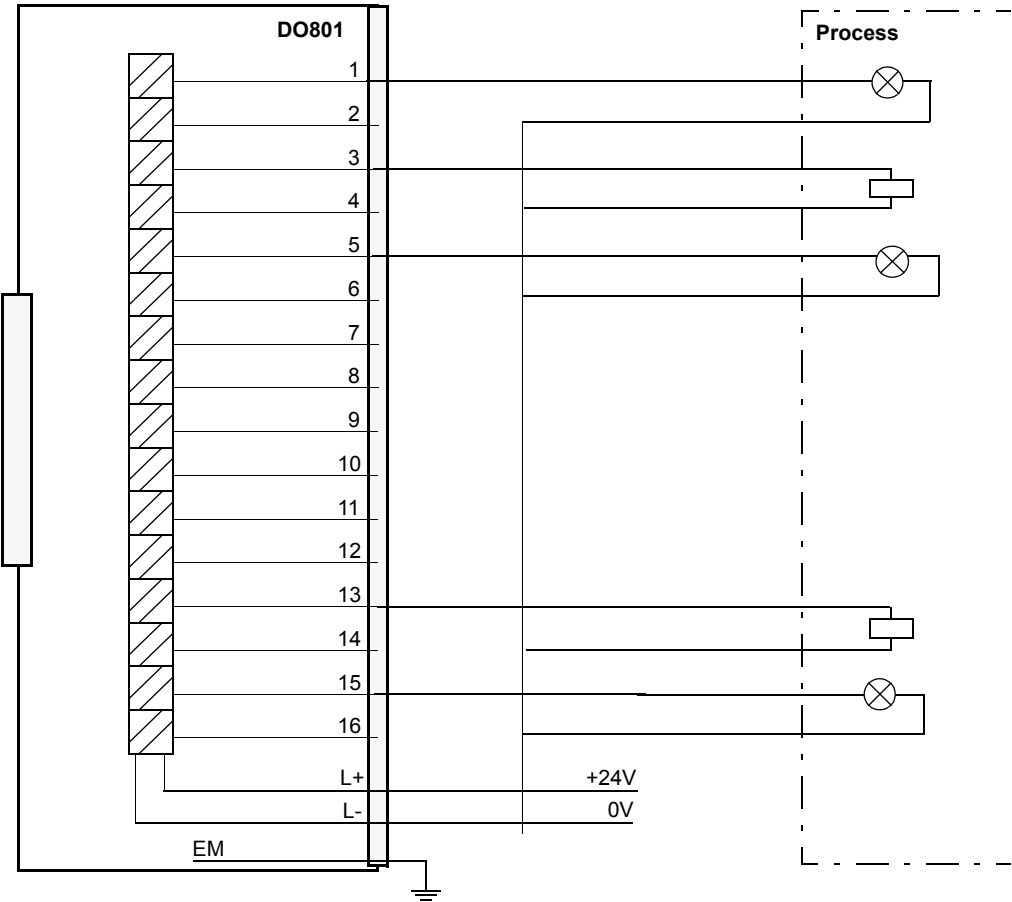


Figure 170. DO801 Process Connections

## DO802 Digital Output Module, 24-250 V, Relay Normally Open

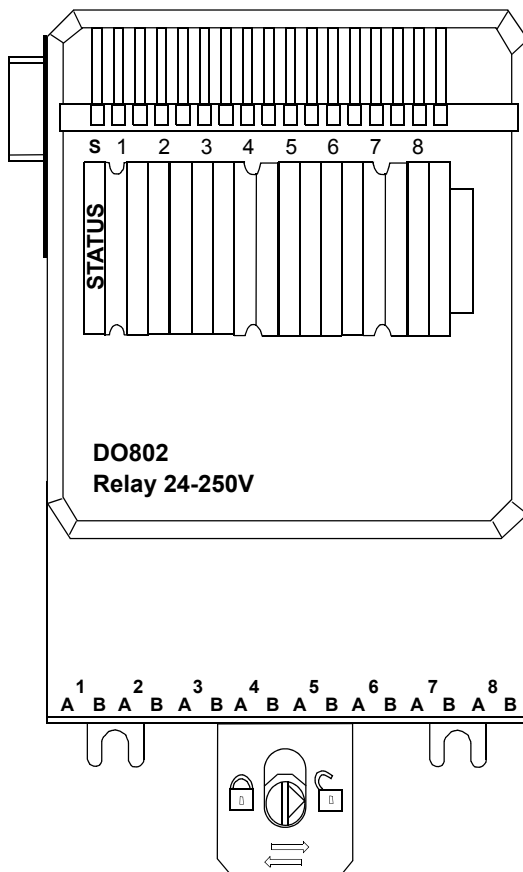
### Features

- 8 channels for 110 V d.c./250 V a.c. relay Normally Open (NO) outputs.
- 8 isolated channels.
- Output status indicators.
- OSP sets outputs to predetermined state upon error detection.
- Process connection via detachable connectors.

### Description

The DO802 is an 8 channel 110 V d.c./250 V a.c. relay (NO) output module for the S800 I/O. The maximum voltage range is 250 V and the maximum continuous output current is 2 A. All outputs are individually isolated.

Each output channel consists of optical isolation barrier, output state indication LED, relay driver, relay and EMC protection components.



The relay supply voltage supervision, derived from the 24 V distributed on the ModuleBus, gives a channel signal error and a module warning signal if the voltage disappears. The error signal and warning signal can be read through the ModuleBus. This supervision can be enabled/disabled with a parameter.

### Technical Data

Table 77. DO802 Digital Output Module Specifications

Feature	DO802 Digital Output Module
Number of channels	8
Type of output	Relay (NO)
Voltage range	24 - 110 V d.c./250 V a.c.
Load current, maximum	2 A
Load current, minimum	5 mA
Max break power	a.c. 500 VA d.c. 60W
Maximum field cable length (d.c., a.c.)	600 meters (656 yd.)
Pick-up time, maximum	10 ms
Release time, maximum	6 ms
Number of operations per hour, maximum	1000
Number of operations per lifetime:	
Mechanical	$>20 \times 10^6$
Electrical at 30 V d.c. / 250 V a.c.	$>0,16 \times 10^6$ (2 A resistive)
Current consumption 5 V (Modulebus)	70 mA
Current consumption 24 V (Modulebus)	80 mA
Power dissipation <sup>(1)</sup>	2.2 W

Table 77. DO802 Digital Output Module Specifications (Continued)

Feature	DO802 Digital Output Module
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Power supervision	24/12 V Relay power converter monitor
Isolation	Individually isolated from ground
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm <sup>2</sup> , 30-12 AWG Stranded: 0.05-1.5mm <sup>2</sup> , 30-12 AWG Recommended torque: 0.5 - 0.6Nm Stripping length: 6-7.5 mm, 0.24-0.30 in

(1) Power dissipation is calculated with 70 percent of the channels activated.



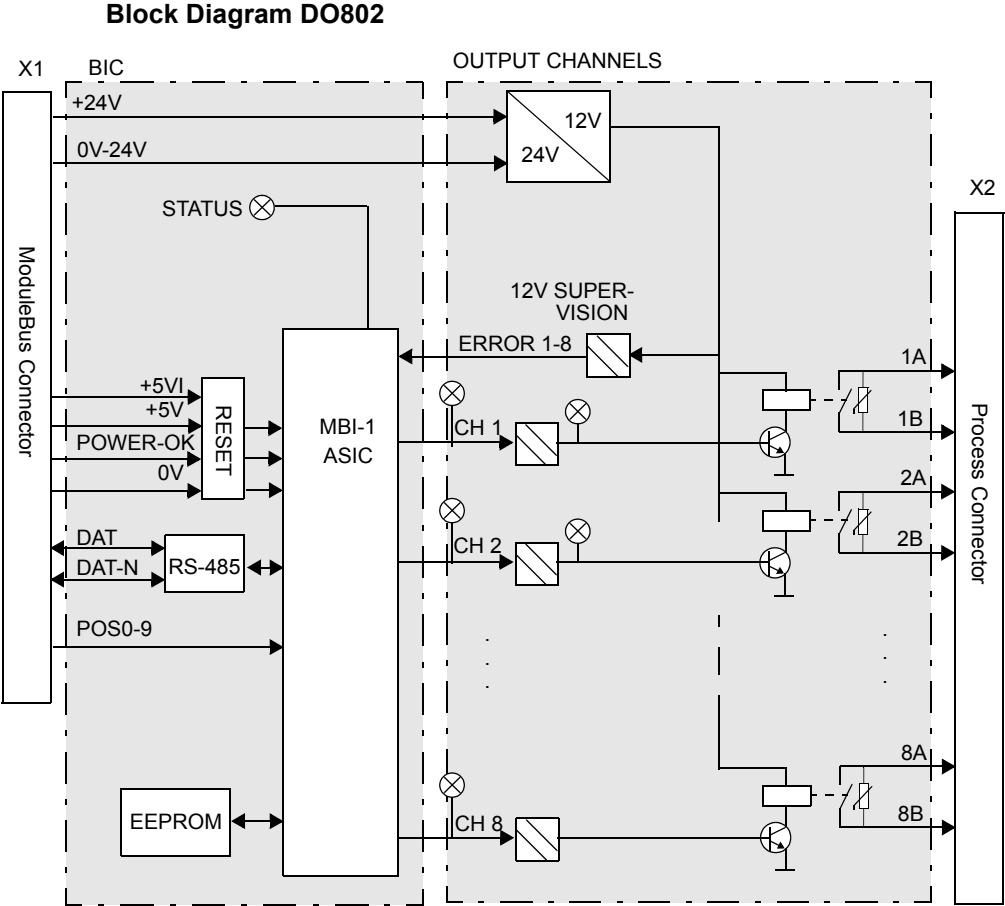


Figure 171. DO802 Block Diagram

Process Connections

Table 78. DO802 Process Connections

Process Connection	Process Terminal
Ch1 Input	1A
	1B
Ch 2 Input	2A
	2B
Ch 3 Input	3A
	3B
Ch 4 Input	4A
	4B
Ch 5 Input	5A
	5B
Ch 6 Input	6A
	6B
Ch 7 Input	7A
	7B
Ch 8 Input	8A
	8B

Figure 172 shows the process connections for the Digital Output Module DO802.

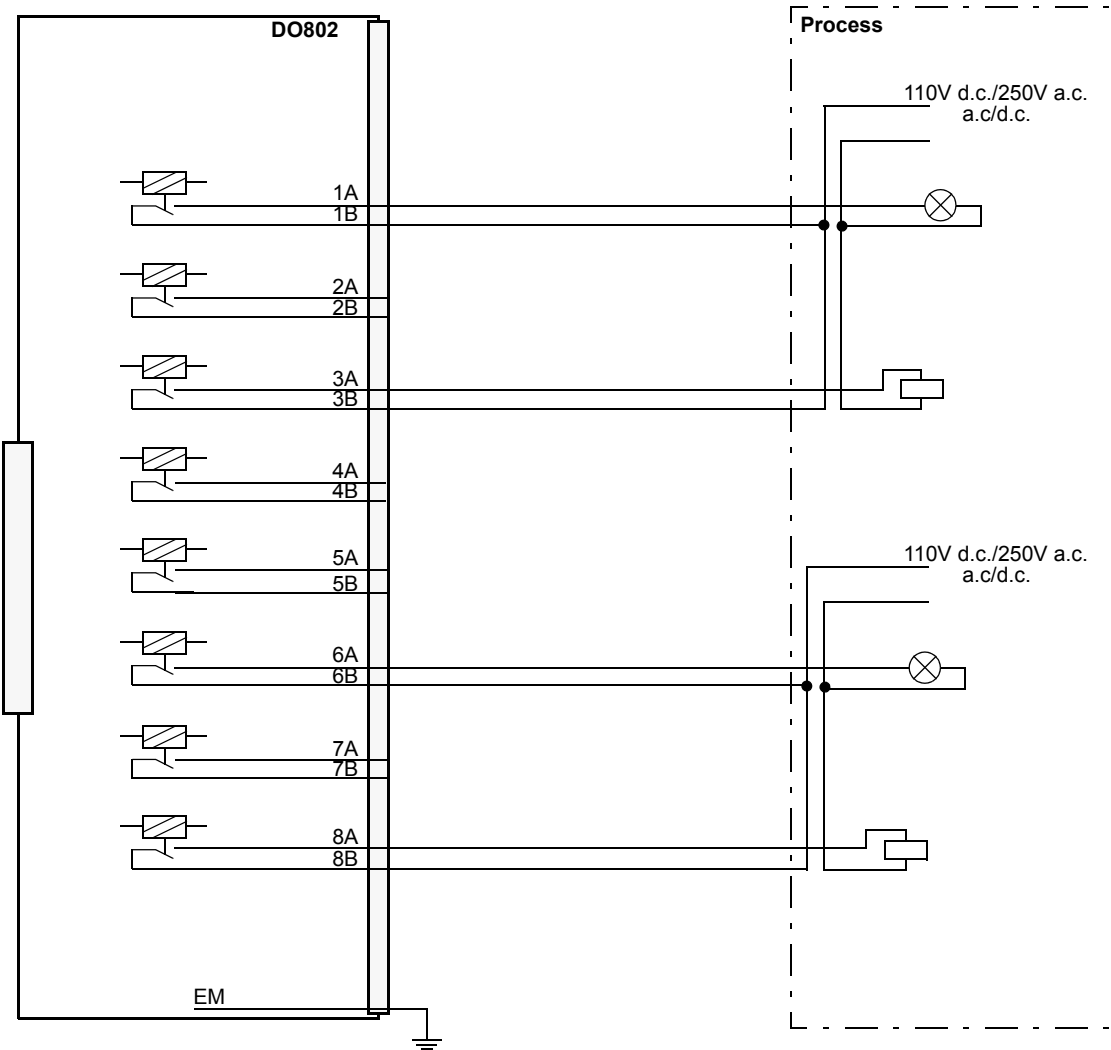


Figure 172. DO802 Process Connections

## DO810 Digital Output Module 24 V, 0.5 A Current Sourcing

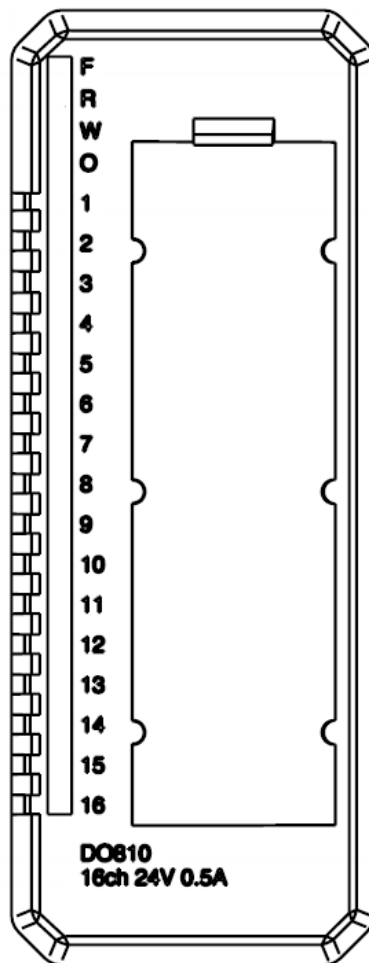
### Features

- 16 channels for 24 V d.c. current sourcing outputs.
- 2 isolated groups of 8 channels with process voltage supervision.
- Output status indicators.
- OSP sets outputs to predetermined state upon error detection.
- Short-circuit protection to ground and 30 V.
- Over-voltage and over-temperature protection.

### Description

The DO810 is a 16 channel 24 V digital output module for the S800 I/O. This module has 16 digital outputs. The output voltage range is 10 to 30 volt and the maximum continuous output current per channel is 0.5 A. The outputs are protected against short circuits, over voltage and over temperature. The outputs are divided into two individually isolated groups with eight output channels and one voltage supervision input in each group.

Each output channel consists of a short circuit and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier.



The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read through the ModuleBus.

The outputs are current limited and protected against over temperature. If the outputs are overloaded the output current will be limited. This means that the power dissipation in the output stage will increase and the output will shutdown if the temperature in the output stage increases above 150°C (302°F). The output will switch on again automatically as the component temperature has decreased to about 140°C (284°F). If any output is shutdown due to overload, the indication LED on that channel is also switched off. The output status of that channel cannot be read from the module.

Four different types of MTUs can be used. TU830 Extended MTU and TU810 (or TU814) Compact MTU have terminals for 24 V output power connections and two terminals per channels. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

### Technical Data

*Table 79. DO810 Digital Output Module Specifications*

Feature	DO810 Digital Output Module
Number of channels	16 (2 x 8)
Type of output	Transistor current sourcing, current limited
Voltage range	12 - 32 V d.c.
Load current, maximum	0.5 A
Short circuit current, maximum	2.4 A
Leakage current, maximum	<10 µa
Output impedance	<0.4 ohm
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption 5 V (Modulebus)	80 mA

Table 79. DO810 Digital Output Module Specifications (Continued)

Feature	DO810 Digital Output Module
Power dissipation <sup>(1)</sup>	2.1 W
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group)
Isolation	Groupwise isolated from ground
Mounting termination units	TU810, TU812, TU814 or TU830
MTU keying code	AA
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated.

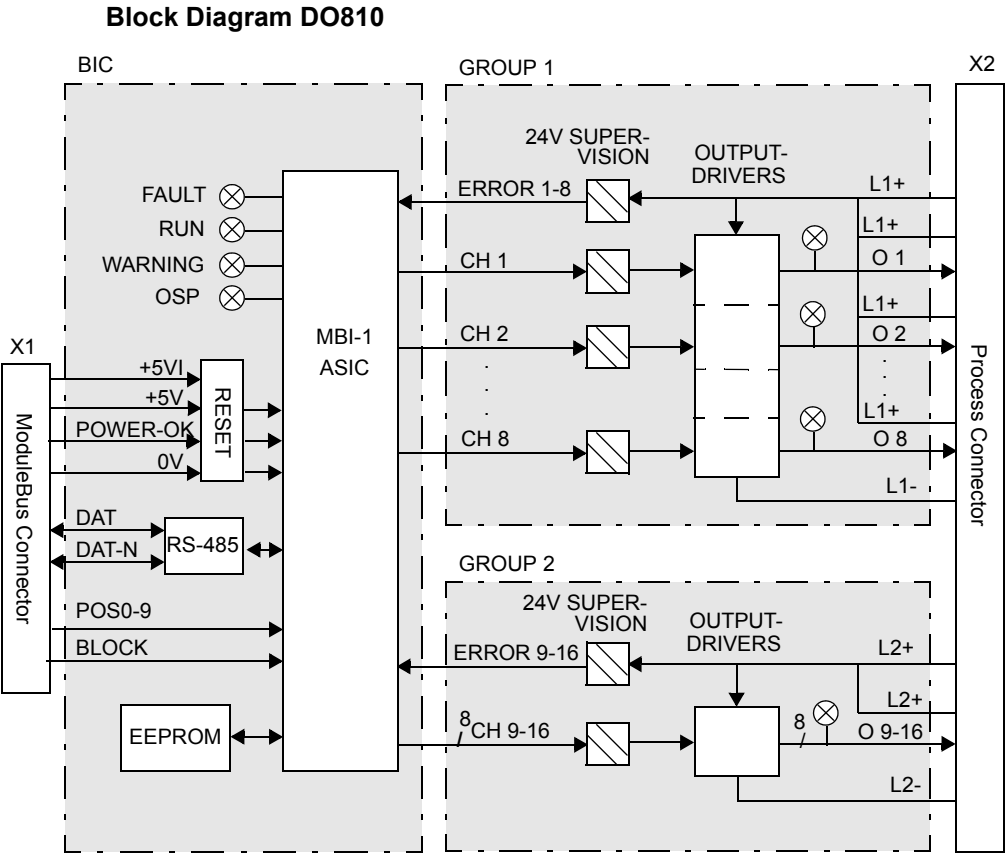


Figure 173. DO810 Block Diagram

**Process Connections***Table 80. DO810 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector <sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)
Ch 1/Ch 2, L1+	-	-	B1, B2
Ch 1 Output	C1	3	C1
Ch 2 Output	B1	16	C2
Ch 1/Ch 2, L1-	A1	-	A1, A2
Ch 3/Ch 4, L1+	-	-	B3, B4
Ch 3 Output	C2	4	C3
Ch 4 Output	B2	17	C4
Ch 3/Ch 4, L1-	A2	-	A3, A4
Ch 5/Ch 6, L1+	-	-	B5, B6
Ch 5 Output	C3	5	C5
Ch 6 Output	B3	18	C6
Ch 5/Ch 6, L1-	A3	-	A5, A6
Ch 7/Ch 8, L1+	-	-	B7, B8
Ch 7 Output	C4	6	C7
Ch 8 Output	B4	19	C8
Ch 7/Ch 8, L1-	A4	-	A7, A8
Ch 9/Ch 10, L2+	-	-	B9, B10
Ch 9 Output	C5	7	C9



Table 80. DO810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal
Ch 10 Output	B5	20	C10
Ch 9/Ch 10, L2-	A5	-	A9, A10
Ch 11/Ch 12, L2+	-	-	B11, B12
Ch 11 Output	C6	8	C11
Ch 12 Output	B6	21	C12
Ch 11/Ch 12, L2-	A6	-	A11, A12
Ch 13/Ch 14, L2+	-	-	B13, B14
Ch 13 Output	C7	9	C13
Ch 14 Output	B7	22	C14
Ch 13/Ch 14, L2-	A7	-	A13, A14
Ch 15/ Ch16, L2+	-	-	B15, B16
Ch 15 Output	C8	10	C15
Ch 16 Output	B8	23	C16
Ch 15/Ch16, L2-	A8	-	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 174 shows the process connections for the Digital Output Module DO810 when installed on a TU830/TU833 Extended MTU.

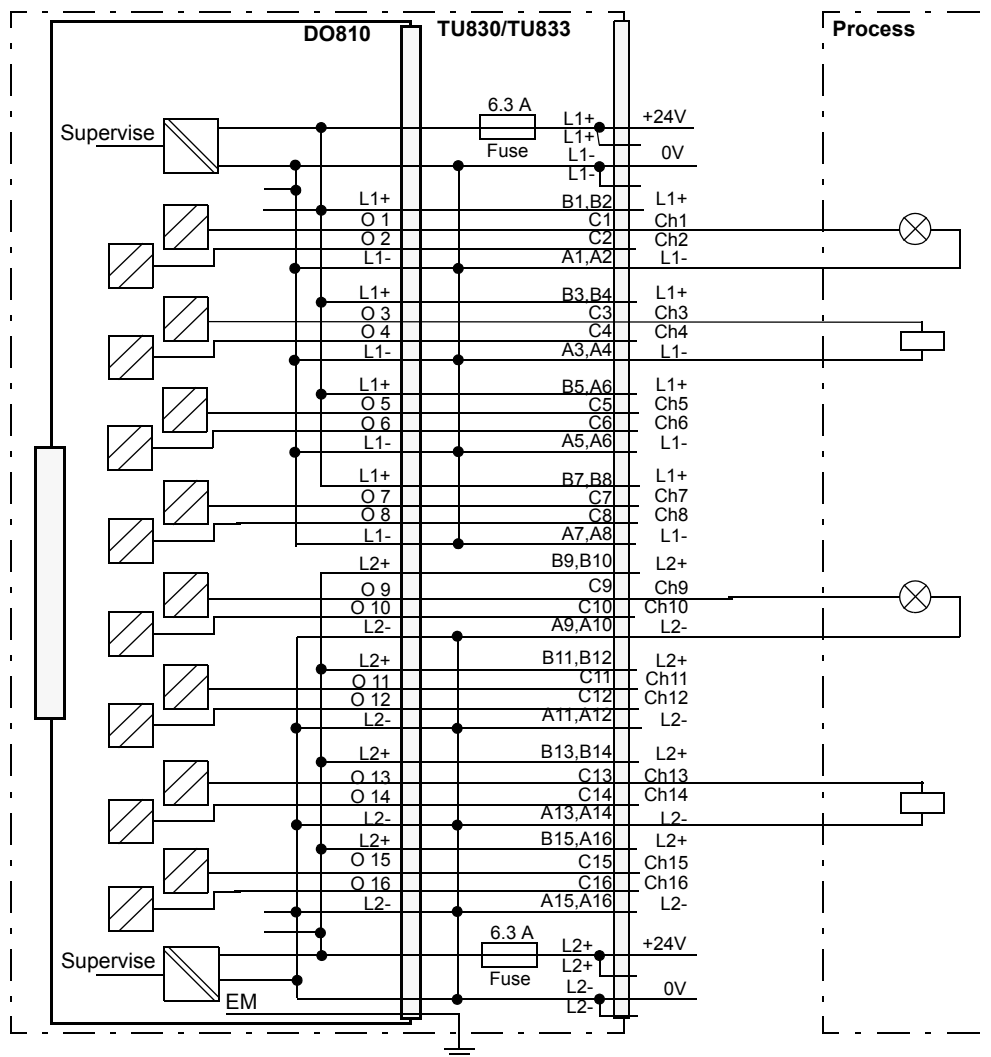


Figure 174. DO810 with TU830/TU833 Extended MTU Process Connections

Figure 175 shows the process connections for the DO810 when installed on a TU810 or TU814 Compact MTU.

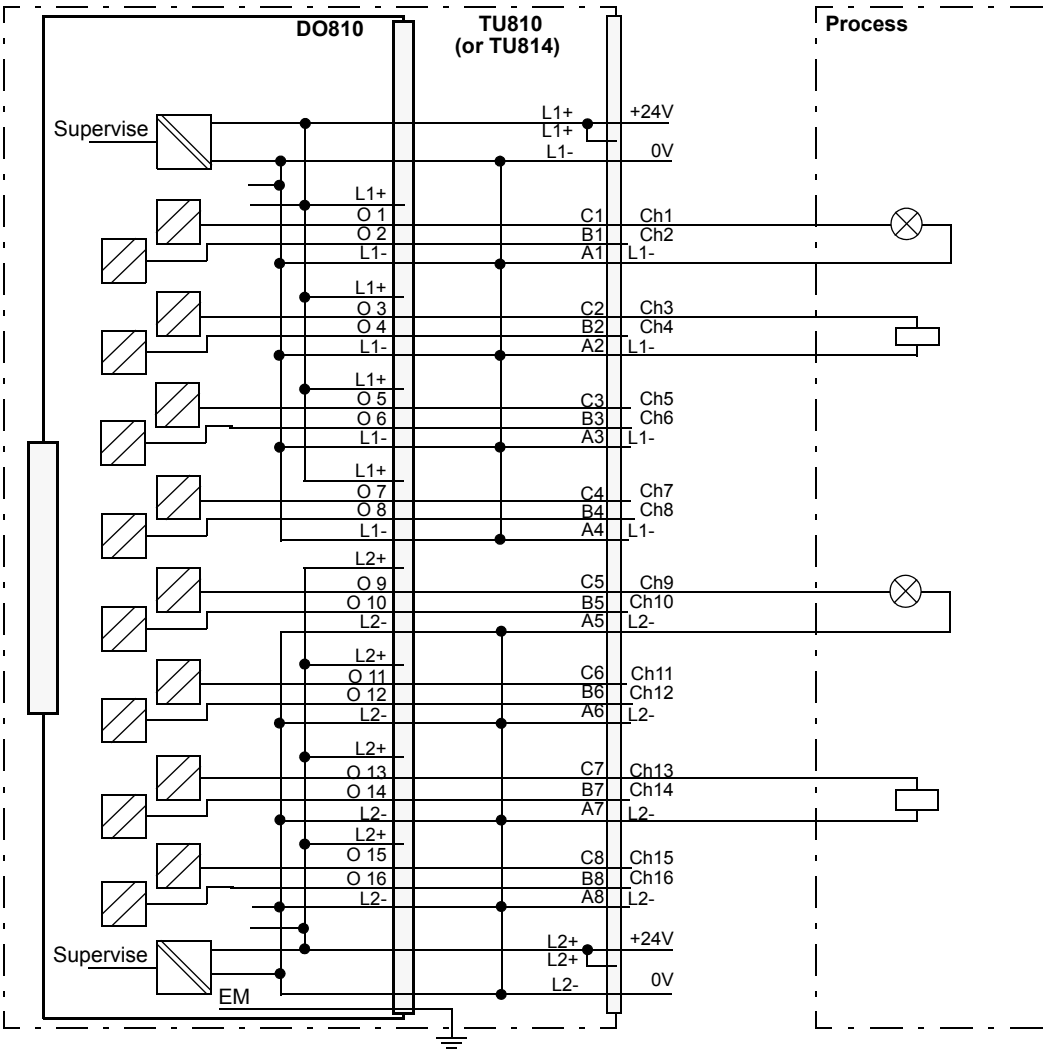


Figure 175. DO810 with TU810 or TU814 Compact MTU Process Connections

Figure 176 shows the process connections for the Digital Output Module DO810 when installed on a TU812 Compact MTU.

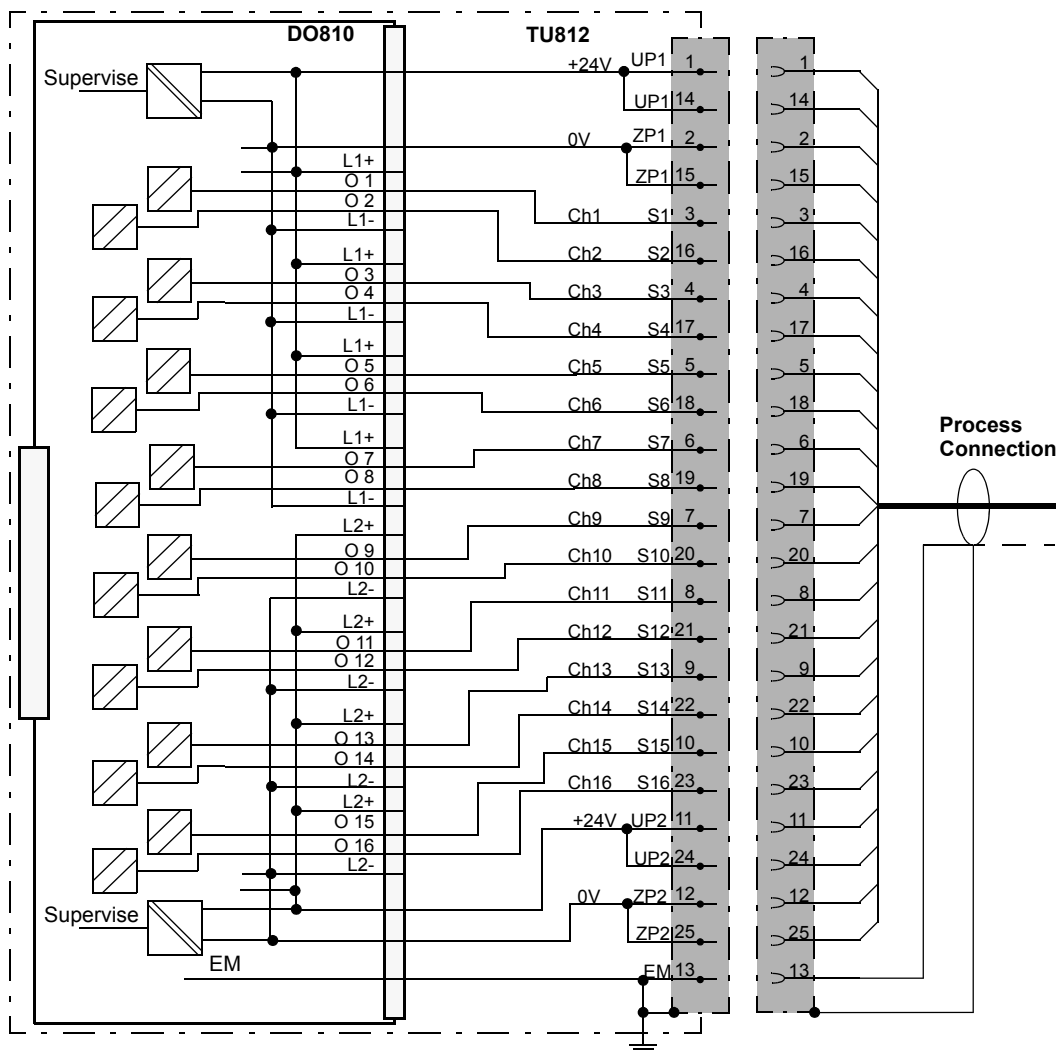


Figure 176. DO810 with TU812 Compact MTU Process Connections

## DO814 Digital Output Module 24 V, 0.5 A, Current Sinking

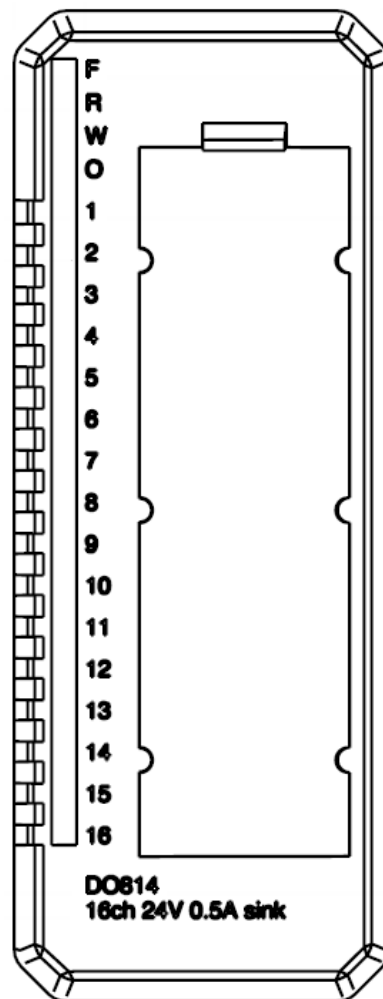
### Features

- 16 channels for 24 V d.c. current sinking outputs.
- 2 isolated groups of 8 channels with process voltage supervision.
- Output status indicators.
- OSP sets outputs to predetermined state upon error detection.
- Short-circuit protection to ground and 30 V.
- Over-voltage and over-temperature protection.

### Description

The DO814 is a 16 channel 24 V digital output module with current sinking for the S800 I/O. The output voltage range is 10 to 30 volt and the maximum continuous current sinking per channel is 0.5 A. The outputs are protected against short circuits and over temperature. The outputs are divided into two individually isolated groups with eight output channels and one voltage supervision input in each group.

Each output channel consists of a short circuit and over temperature protected low side switch, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier.



The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus.

The outputs are current limited and protected against over temperature. If the outputs are overloaded the output current sinking will be limited. This means that the power dissipation in the output stage will increase and the output will shutdown if the temperature in the output stage increases above 150°C (302°F). The output will switch on again automatically as the component temperature has decreased to about 140°C (284°F).

Five different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V output power connection, but requires external terminals for distribution of 24 V power supply to the devices. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. TU838 provide a fuse (3 A max.) per two channels or process power output.

### Technical Data

*Table 81. DO814 Digital Output Module Specifications*

Feature	DO814 Digital Output Module
Number of channels	16 (2 x 8) current sinking
Type of output	Transistor current sinking, current limited
Voltage range	12 - 32 V d.c.
Load current, maximum	0.5 A
Short circuit current, maximum	2.4 A
Leakage current, maximum	<10 µa
Output impedance	<0.4 ohm
Maximum field cable length	600 meters (656 yd.)
Current consumption 5 V (Modulebus)	80 mA
Power dissipation <sup>(1)</sup>	2.1 W

Table 81. DO814 Digital Output Module Specifications (Continued)

Feature	DO814 Digital Output Module
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group)
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812, TU814, TU830 or TU838
MTU keying code	BE
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated.



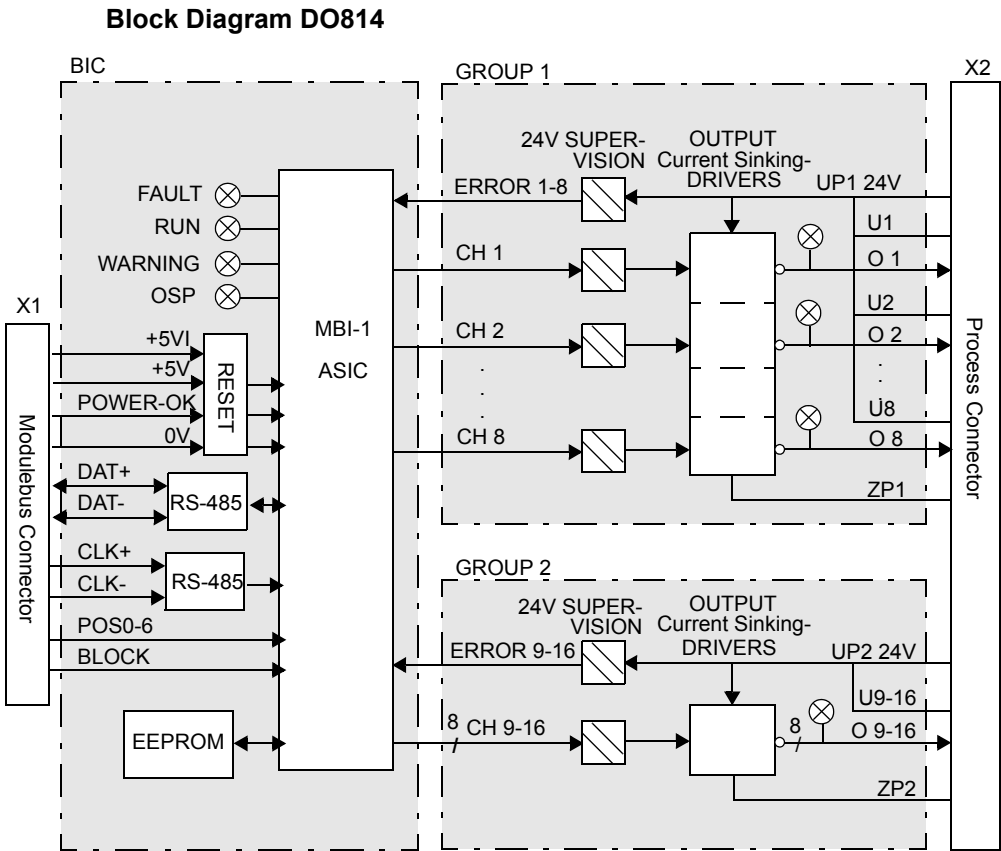


Figure 177. DO814 Block Diagram

**Process Connections***Table 82. DO814 Process Connection*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector <sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>	<b>TU838 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)
Ch 1/Ch 2, L1+	-	-	B1, B2	A1 (F1)
Ch 1 Output	C1	3	C1	B1
Ch 2 Output	B1	16	C2	B2
Ch 1/Ch 2, L1-	A1	-	A1, A2	A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)
Ch 3 Output	C2	4	C3	B3
Ch 4 Output	B2	17	C4	B4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)
Ch 5 Output	C3	5	C5	B5
Ch 6 Output	B3	18	C6	B6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)
Ch 7 Output	C4	6	C7	B7
Ch 8 Output	B4	19	C8	B8
Ch 7/Ch 8, L1-	A4	-	A7, A8	A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)
Ch 9 Output	C5	7	C9	B9

Table 82. DO814 Process Connection (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal	TU838 Terminal
Ch 10 Output	B5	20	C10	B10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)
Ch 11 Output	C6	8	C11	B11
Ch 12 Output	B6	21	C12	B12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)
Ch 13 Output	C7	9	C13	B13
Ch 14 Output	B7	22	C14	B14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)
Ch 15 Output	C8	10	C15	B15
Ch 16 Output	B8	23	C16	B16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 178 shows the process connections for the Digital Output Module DO814 when installed on a TU830/TU833 Extended MTU.

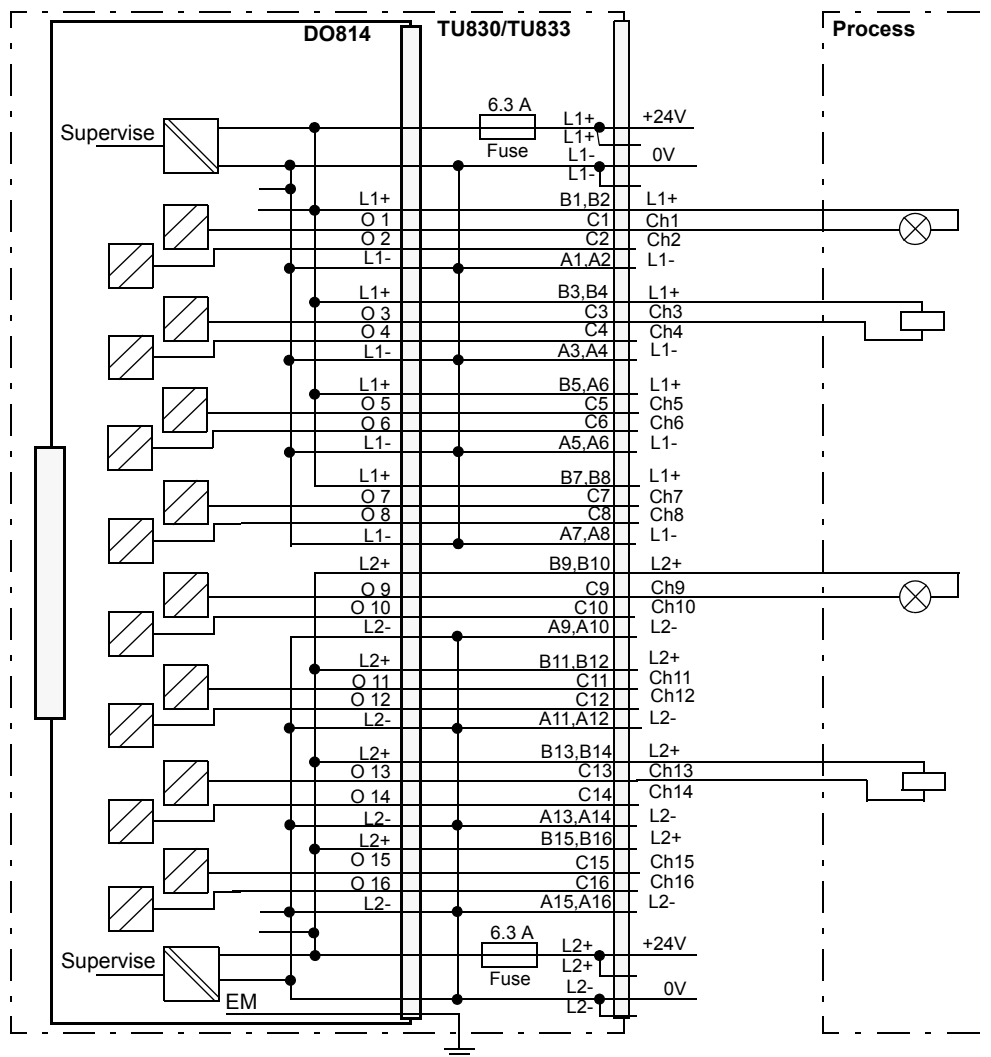


Figure 178. DO814 with TU830/TU833 Extended MTU Process Connections

Figure 179 shows the process connections for the Digital Output Module DO814 (current sinking) when installed on a TU838 Extended MTU.

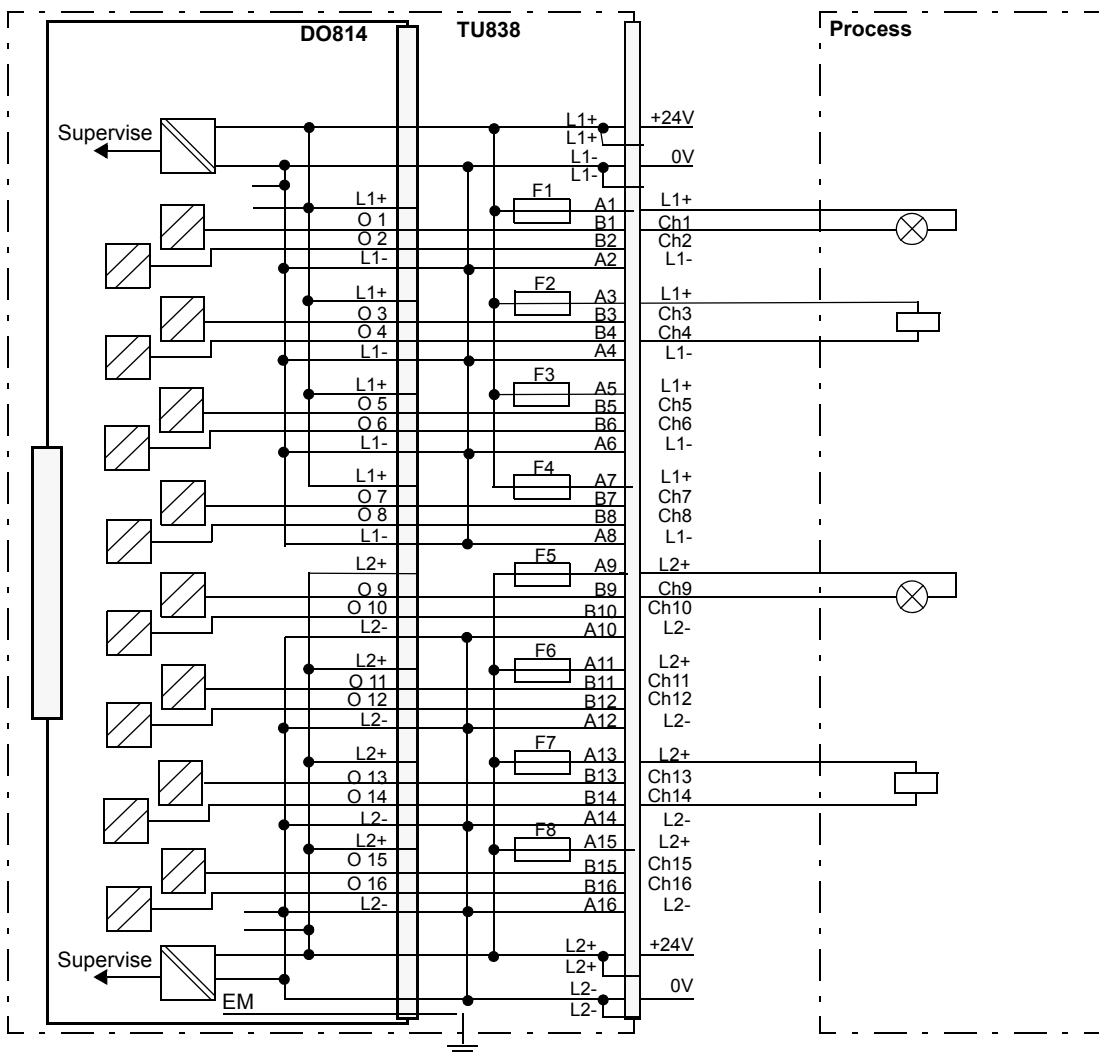


Figure 179. DO814 with TU838 Extended MTU Process Connections

Figure 180 shows the process connections for the DO814 when installed on a TU810 or TU814 Compact MTU.

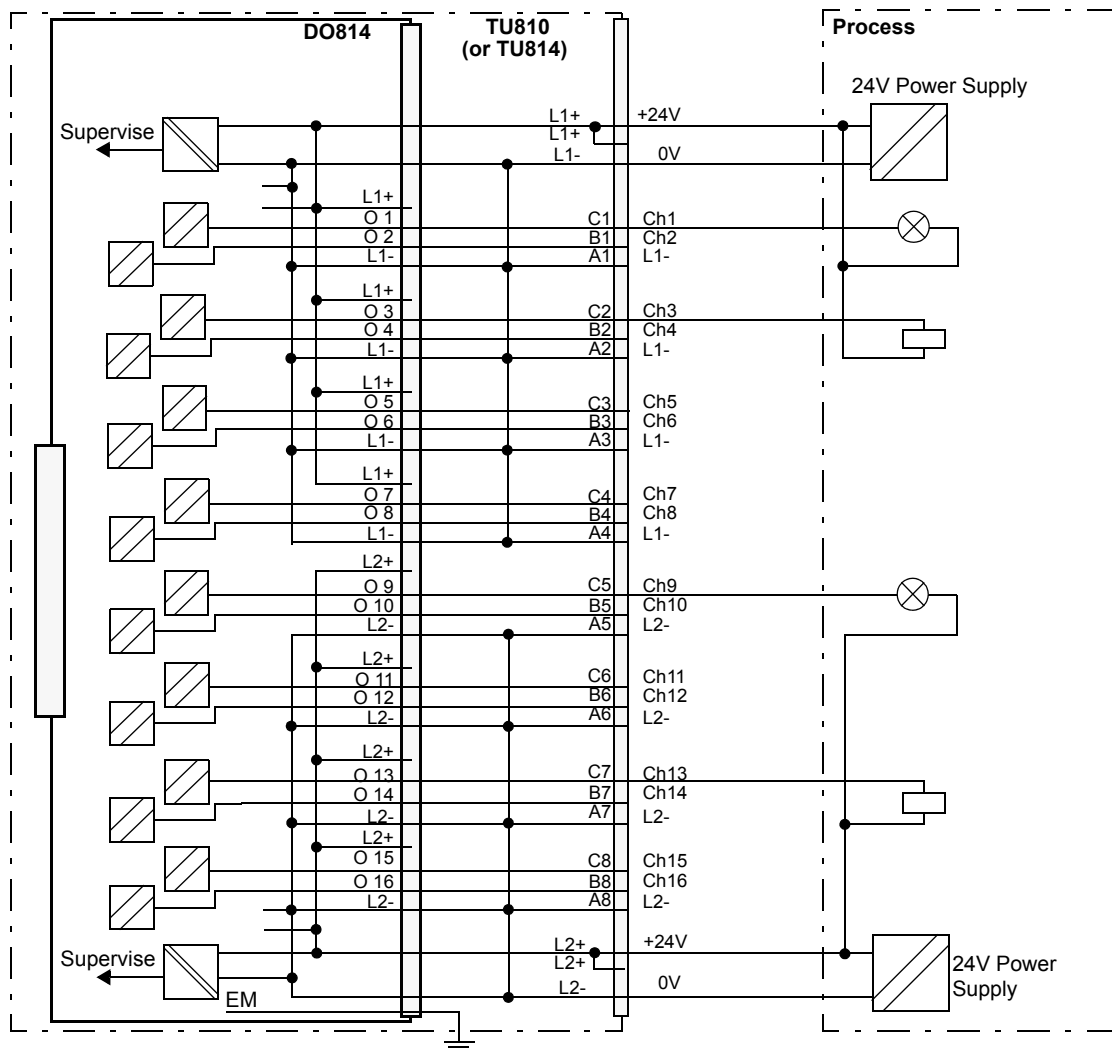


Figure 180. DO814 with TU810 or TU814 Compact MTU Process Connections

Figure 181 shows the process connections for the Digital Output Module DO814 when installed on a TU812 Compact MTU.

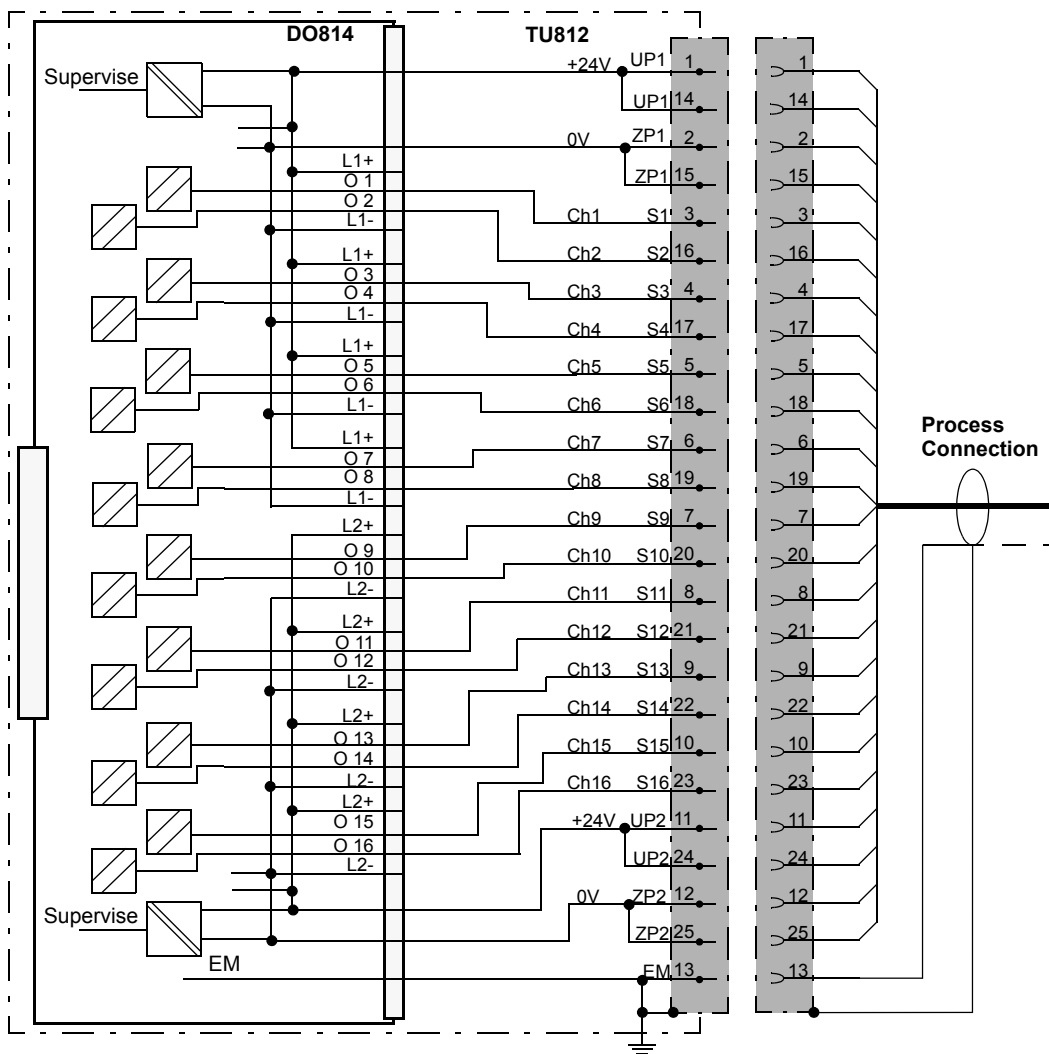


Figure 181. DO814 with TU812 Compact MTU Process Connections

## DO815 Digital Output Module 24 V, 2 A, Current Sourcing

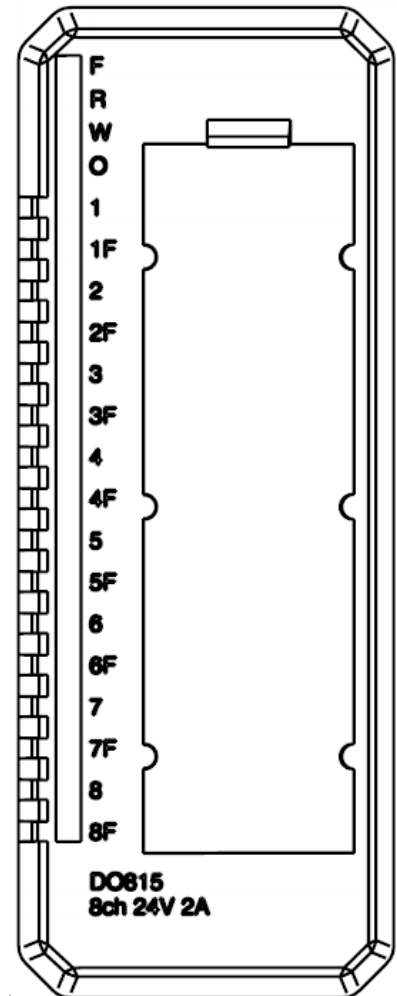
### Features

- 8 channels for 24 V d.c. current sourcing outputs.
- 2 isolated groups of 4 channels with under voltage detection.
- OSP sets outputs to predetermined state upon communication error.
- Output status indicators and a channel wise error flag.
- Short-circuit protection to ground and positive supply.
- Over load protection.
- Open load and short-circuit detection.
- Two output fault operation modes: Automatic reset mode and Fault latching mode.
- Inductive load driving capability.
- Filament lamp load up to 10W.

### Description

The DO815 is a 8 channel 24 V digital output module for the S800 I/O. The output voltage range is 10 to 30 V and the maximum continuous output current per channel is 2 A @ 24 V. The outputs are protected against short circuits, and over load. The outputs are divided into two individually isolated groups with four output channels in each group.

Each output channel consists of a short circuit and over load protected high side driver with open load detection (on active signal), EMC protection components,





inductive load suppression, output status indication LEDs and optical isolation barrier.

In addition to the four module LEDs, DO815 has two LEDs (one Yellow and one Red) per channel. The Yellow LED indicates the output state (Yellow = output is energized, Off = output is de-energized). The Red LED indicates channel errors such as short circuit, over load, under voltage and open load (Red = channel error, Off = no channel error).

The driver outputs provide a “free-wheel diode” to demagnetize inductive loads. No external demagnetization arrangement is required up to loads of 1J.

DO815 outputs are able to drive filament lamp loads up to 10W, but only in Automatic reset mode.

DO815 provides two protection operation modes. Each channel can be configured to operate in one of the two modes:

1. Automatic reset mode (Default mode): The fault condition disappears, then the fault disappears, and the operation is resumed.
2. Fault latching mode (This mode is not applicable in all controllers): The output is switched off by any of the fault conditions. The fault latch remains in fault condition until reset by temporarily setting the automatic reset mode.

The output drivers are current limited and protected against over load. If an output has a short circuit to ground, the output current will be limited and the driver will shutdown in order to minimize the power dissipation. In the automatic reset mode, the output will switch on again automatically after a defined time interval. If the short circuit condition is still present, the output is turned off again, otherwise the normal operation is resumed.

In the fault latching mode, the output remains off until the fault condition is not valid and the reset of the fault latch is activated. If any output is shutdown due to fault condition, the indication LED (Yellow) on that channel remains on if the channel is activated. The output status of the channel can be read from the module.

Four different types of MTUs can be used, TU830 Extended MTU and TU810, TU812 or TU814 Compact MTU have terminals for 24 V output power connection and terminals for the output channels. With use of TU812 the current per group is limited to 5 A.

### Technical Data

Table 83. DO815 Digital Output Module Specifications

Feature	DO815 Digital Output Module
Number of channels	8 (2 x 4)
Type of output	High side driver, current limited
Process voltage (L+) Normal Range	24 V d.c. 10 - 32 V d.c.
On-state output voltage drop	Max. 0.5 V
Load current, maximum	2 A @ 24 V, 2,5 A @ 30 V
Total permissible current of outputs per group	Max. 6 A
Loop monitoring	Open circuit and short circuit detection in energized state.
Short circuit current	Max. 4 A
Open load detection current <sup>(1)</sup>	< 6 mA
Leakage current, maximum	Max. 500 $\mu$ A
Output impedance	<0.25 ohm
Filament lamp load only in Automatic reset mode	Max. 10W
Inductive load switch off energy	Max. 1J

Table 83. DO815 Digital Output Module Specifications (Continued)

Feature	DO815 Digital Output Module
Output signal delay	Max. 0.2 ms
Switching frequency resistive load	Max. 200 Hz
Switching frequency inductive load	Max. 2.5 Hz
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption 5 V (Modulebus)	120 mA, 150 mA max.
Power dissipation <sup>(2)</sup>	4 W @ 24 V
Output Set as Predetermined (OSP) timer	256 <sup>(3)</sup> , 512, 1024 ms
Isolation	Groupwise isolated from ground
Module termination units	TU810, TU812 <sup>(4)</sup> , TU814 or TU830
MTU keying code	AA
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) On active signal

(2) Power dissipation is calculated with 70 percent of the channels activated.

(3) 256 ms are used for Master. Set by the user for MOD.

(4) Current per group is limited to 5 A.

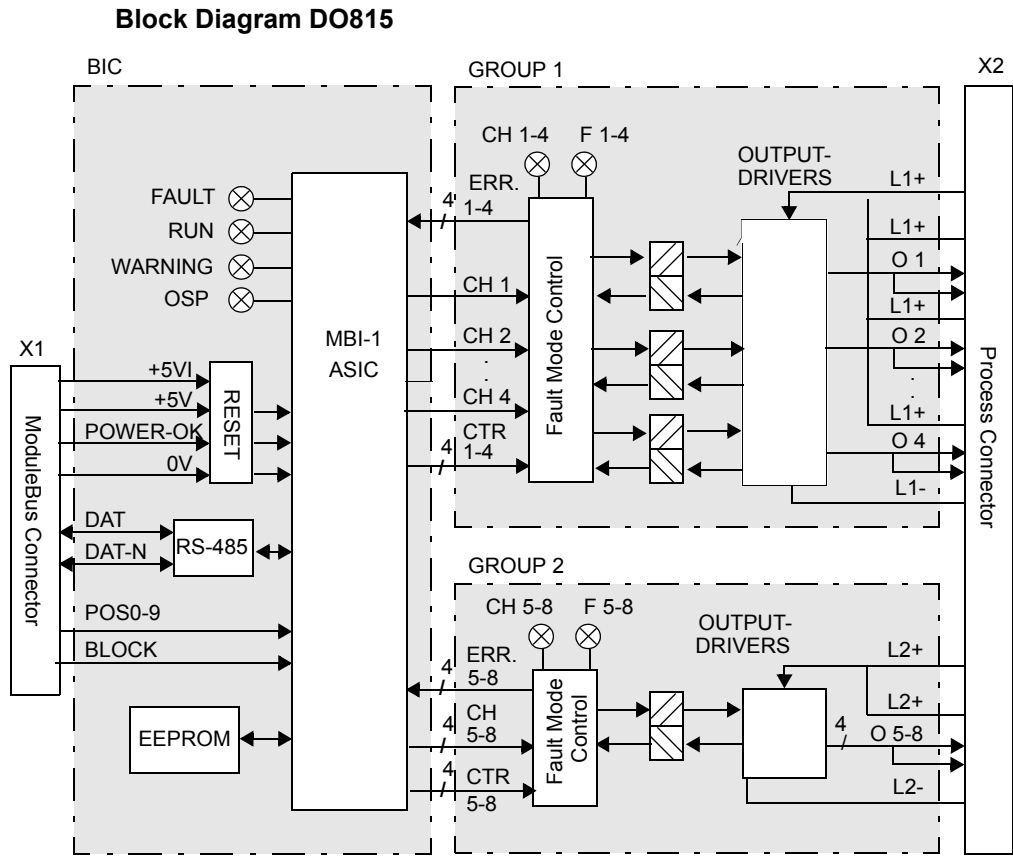


Figure 182. DO815 Block Diagram

**Process Connections***Table 84. DO815 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 Terminal</b>	<b>TU830/TU833 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)
Ch 1/ L1+	-	-	B1, B2
Ch 1 Output	C1, B1	3, 16	C1, C2
Ch 1/L1-	A1	-	A1, A2
Ch 2/L1+	-	-	B3, B4
Ch 2 Output	C2, B2	4, 17	C3
Ch 2/, L1-	A2	-	A3, A4
Ch 3/ L1+	-	-	B5, B6
Ch 3Output	C3, B3	5, 18	C5
Ch 3/ L1-	A3	-	A5, A6
Ch 4/ L1+	-	-	B7, B8
Ch 4 Output	C4, B4	6, 19	C7
Ch 4/ L1-	A4	-	A7, A8
Ch 5/ L2+	-	-	B9, B10
Ch 5 Output	C5, B5	7, 20	C9
Ch 5/ L2-	A5	-	A9, A10
Ch 6/ L2+	-	-	B11, B12
Ch 6 Output	C6, B6	8, 21	C11
Ch 6/ L2-	A6	-	A11, A12

Table 84. DO815 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 Terminal	TU830/TU833 Terminal
Ch 7/ L2+	-	-	B13, B14
Ch 7 Output	C7, B7	9, 22	C13
Ch 7/ L2-	A7	-	A13, A14
Ch 8/ L2+	-	-	B15, B16
Ch 8 Output	C8, B8	10, 23	C15
Ch 8/ L2-	A8	-	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)

Figure 183 shows the process connections for the Digital Output Module DO815 when installed on a TU830/TU833 Extended MTU.

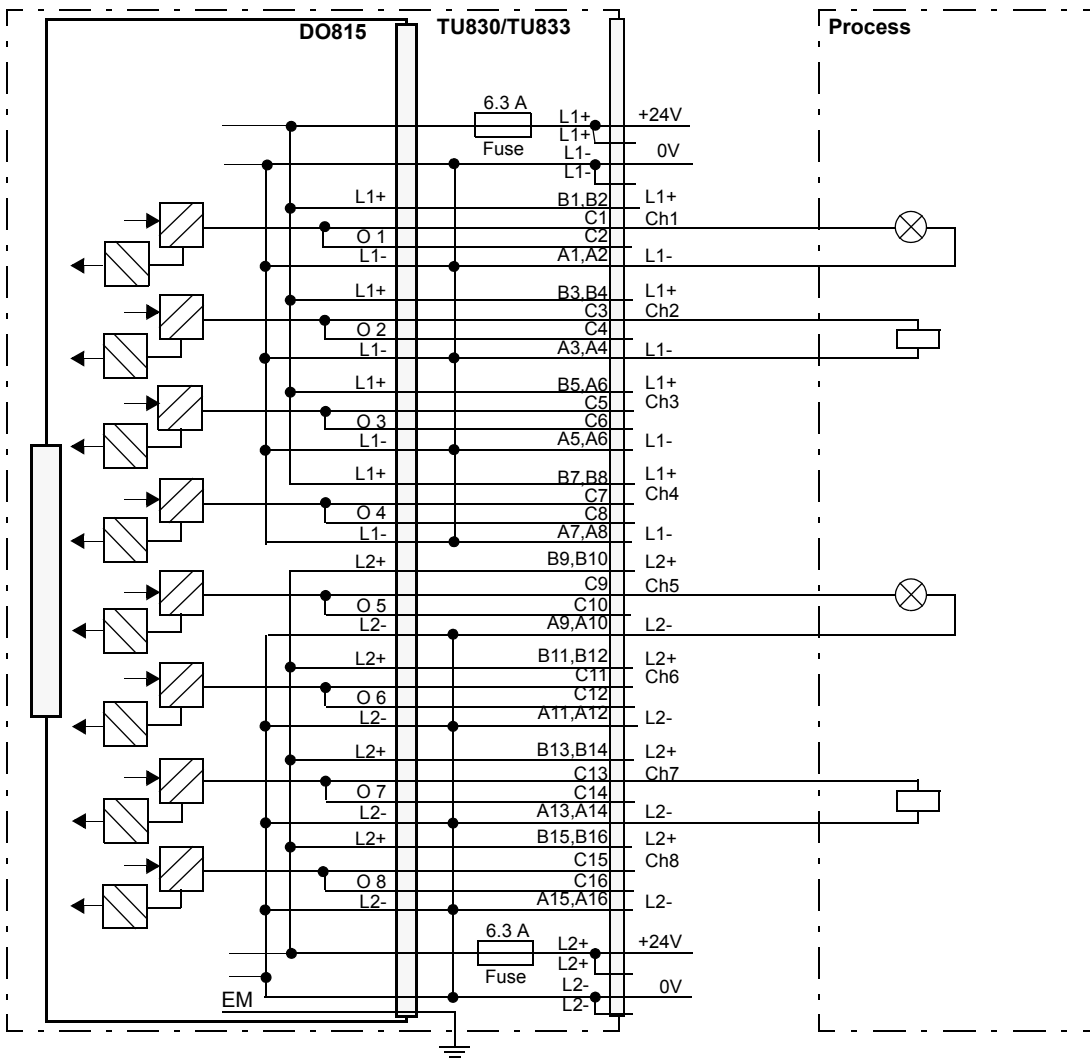


Figure 183. DO815 with TU830/TU833 Extended MTU Process Connections

Figure 184 shows the process connections for the Digital Output Module DO815 when installed on a TU812 Compact MTU.

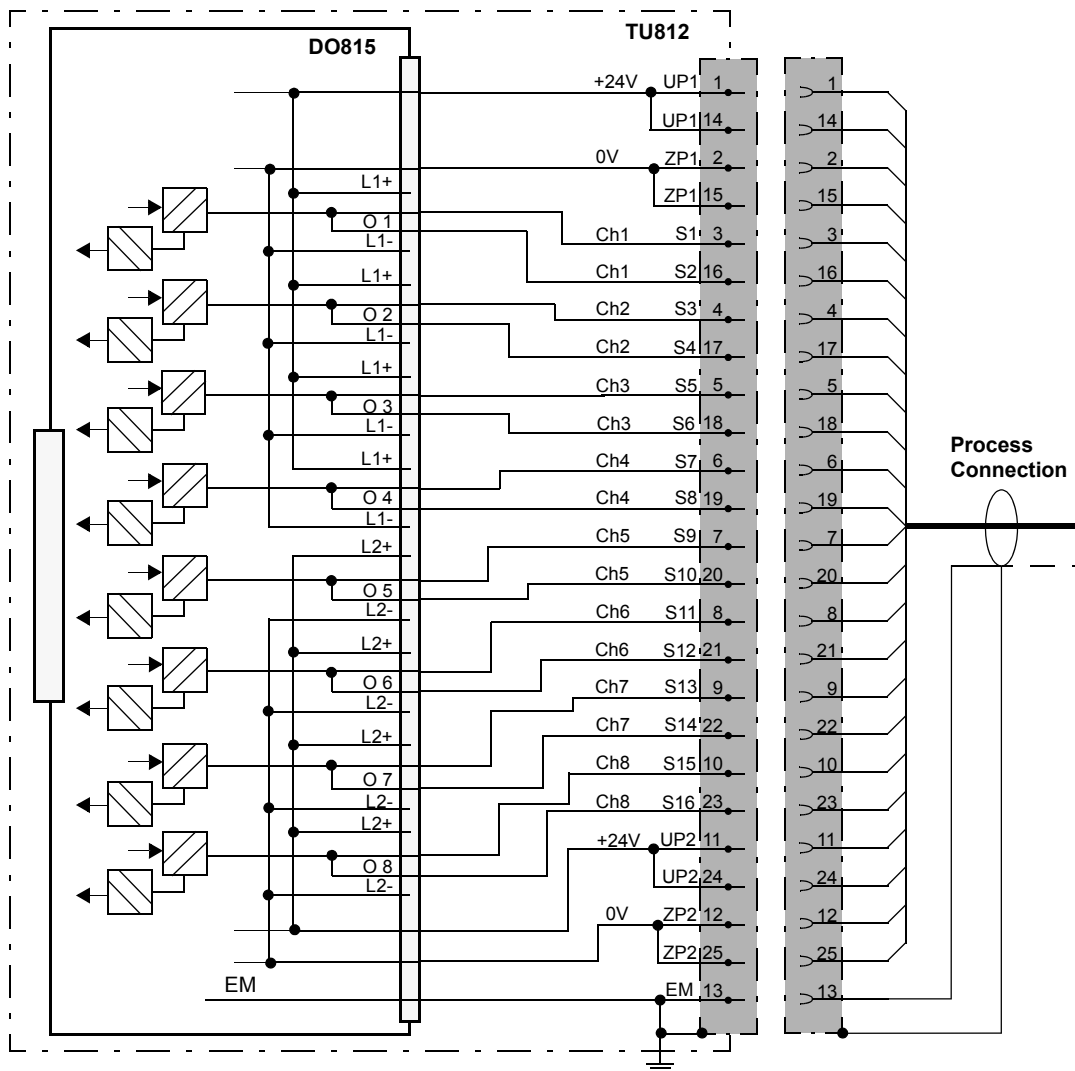


Figure 184. DO815 with TU812 Compact MTU Process Connections



Figure 185 shows the process connections for the DO815 when installed on a TU810 or TU814 Compact MTU.

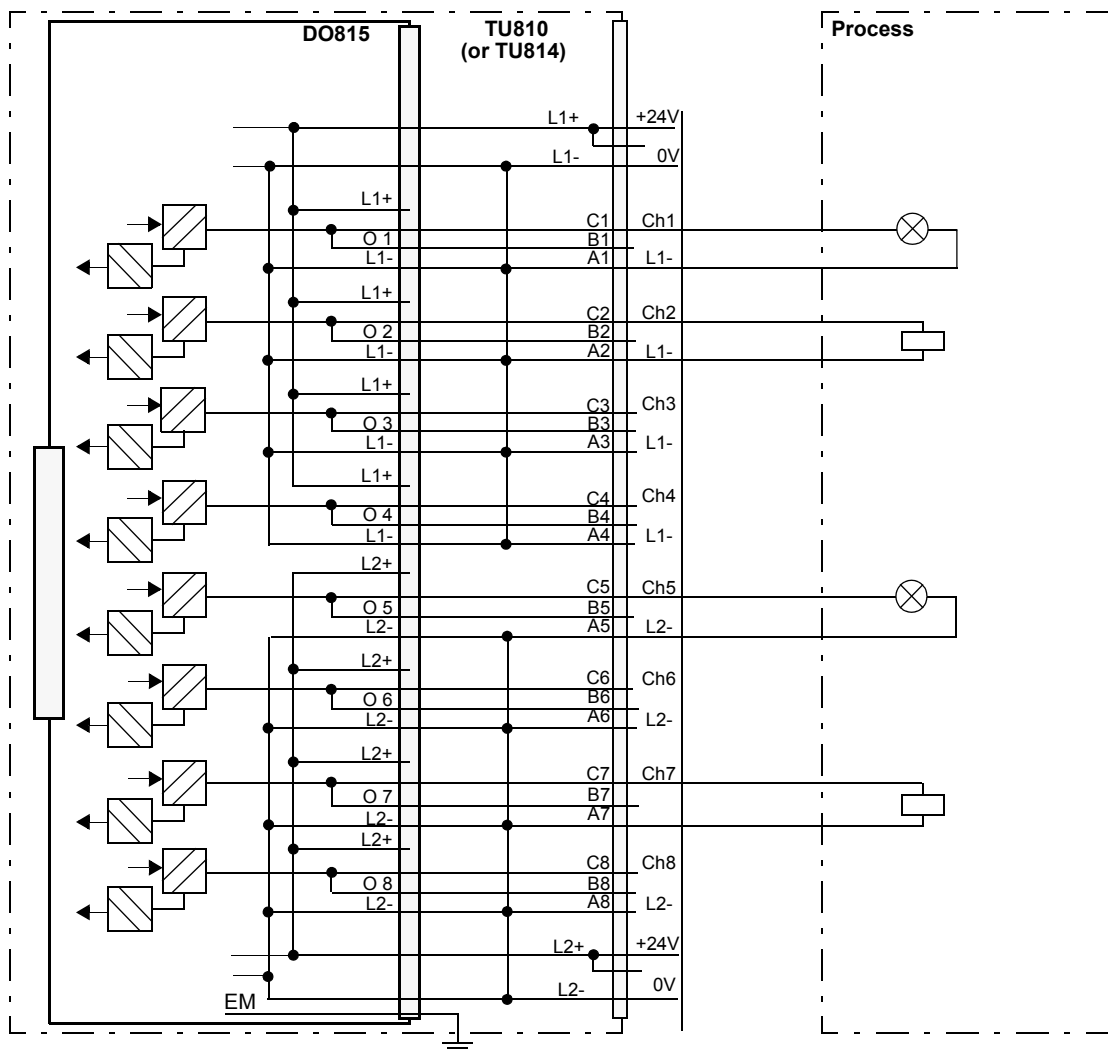


Figure 185. DO815 with TU810 or TU814 Compact MTU Process Connections

## DO818 Digital Output Module 24 V, 0.5 A, Current Sourcing

### Features

- 32 channels for 24 V d.c.
- 2 isolated groups (RIV50V) with 16 channels and one process voltage supervision input in each group.
- The process voltage range is 12-32V dc (nominally 24V dc) and the maximum continuous output current is 0.5A per channel.

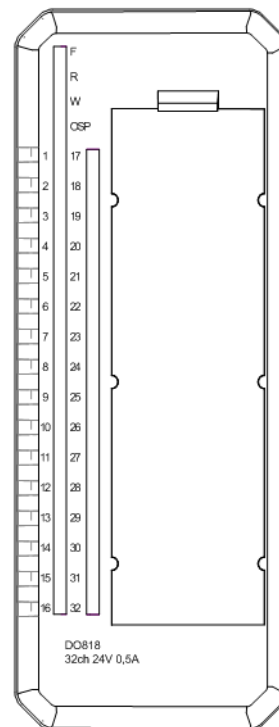
### Description

The DO818 is a 32 channel 24 V digital output module for the S800 I/O. The output voltage range is 12 to 32 volt and the maximum continuous output current per channel is 0.5 A.

The outputs are protected against short circuits, over voltage and over temperature. The outputs are divided into two individually isolated groups with 16 output channels and one voltage supervision input in each group.

Each output channel consists of a short circuit and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier. The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read through the ModuleBus.

The channel-wise high side drivers are short circuit and over temperature protected. The outputs are provided with a current limitation that enters a repetitive switched mode after an initial peak current has been exceeded. The initial peak short circuit current limit is set to  $I_{L(SCp)}$  (typ 1.4A). During the repetitive mode short circuit current, the limit is set to  $I_{L(SCr)}$  (typ 1.1A). If this operation leads to an over temperature condition, over 135°C, a second protection level ( $T_j > 135^\circ\text{C}$ ) changes the output into a low duty cycle PWM (selective thermal shutdown with restart) to



prevent critical chip temperatures. If base chip temperature reaches a critical temperature, all outputs are turned off. The output circuitry will shut off if the process power drops below 11V.

The I/O signals are connected to the MTU with the process connector. Three different types of MTUs can be used. The extended MTU (TU830) provides 32 outputs terminals and 16 return terminals. The compact MTU (TU818) provides 1-wire connection to the load. The compact MTU (TU819) has two D-sub 25 pin connectors for interfacing with the process.

### Technical Data

Table 85. DO818 Digital Output Module Specifications

Feature	DO818 Digital Output Module
Number of channels	32 (2 x 16)
Type of output	Transistor current sourcing, current limited
Voltage range	12 - 32 V d.c.
Load current, maximum	0.5 A
Short circuit current, maximum	< 2 A
Leakage current, maximum	<30 $\mu$ a
Output impedance	<0.32 ohm
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption 5 V (Modulebus)	Typ 70 mA
Power dissipation <sup>(1)</sup>	2.8 W
Current consumption 24 V (process power supply, UPx)	40mA

Table 85. DO818 Digital Output Module Specifications (Continued)

Feature	DO818 Digital Output Module
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group) Activated when process power drops below 12V.
Isolation	Groupwise isolated from ground
Mounting termination units	TU830, TU818, TU819
MTU keying code	EA
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated.

Block Diagram DO818

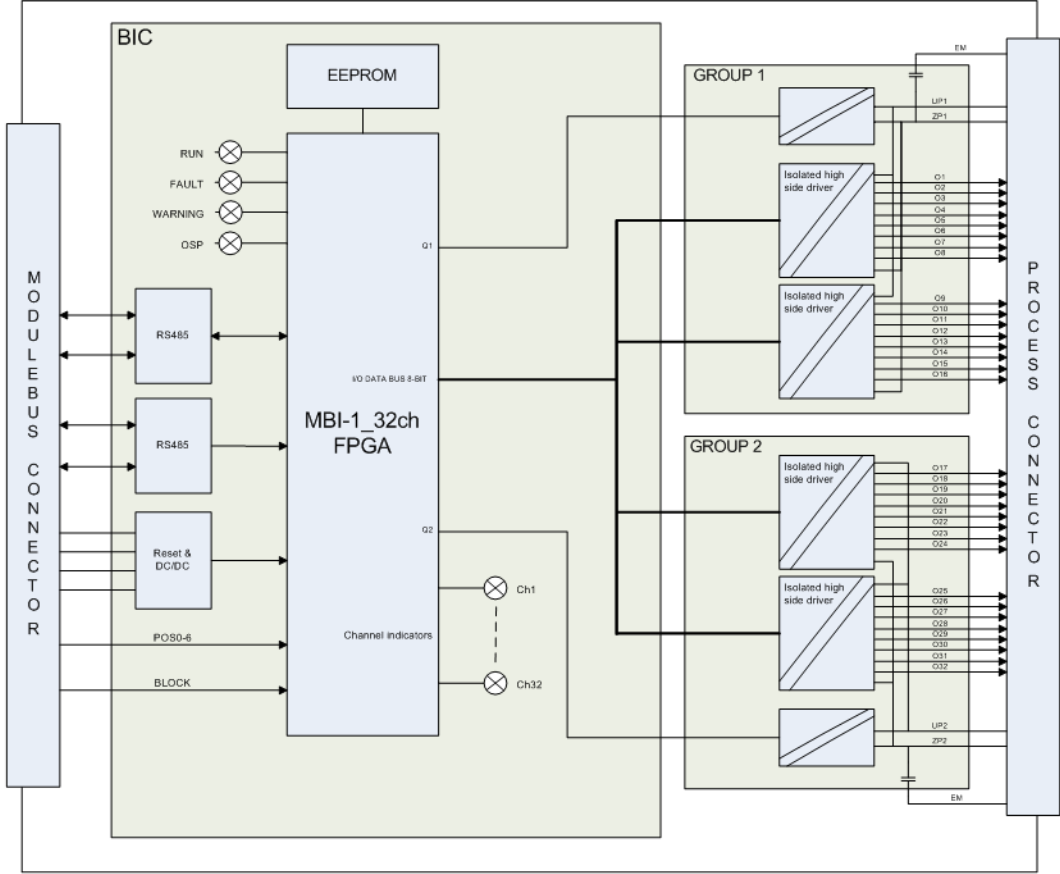


Figure 186. DO818 Block Diagram

## Process Connections

Table 86. DO818 Process Connections

Process Connection	TU830	TU818	TU819
24 V dc	L1 + (2)	L2 + (2)	1, 14, 11, 24 (X1a)
0 V dc	L1 - (2)	L1- (2)	2, 15, 12, 25 (X1a)
Ch 1 Output	C1	D1	3 (X1a)
Ch 2 Output	B1	C1	16 (X1a)
Ch 1/Ch 2, L1 -	A1	-	-
Ch 3 Output	C2	B1	4 (X1a)
Ch 4 Output	B2	A1	17 (X1a)
Ch 3/Ch 4, L1 -	A2	-	-
Ch 5 Output	C3	D2	5 (X1a)
Ch 6 Output	B3	C2	18 (X1a)
Ch 5/Ch 6, L1 -	A3	-	-
Ch 7 Output	C4	B2	6 (X1a)
Ch 8 Output	B4	A2	19 (X1a)
Ch 7/Ch 8, L1 -	A4	-	-
Ch 9 Output	C5	D3	7 (X1a)
Ch 10 Output	B5	C3	20 (X1a)
Ch 9/Ch 10, L1 -	A5	-	-
Ch 11 Output	C6	B3	8 (X1a)
Ch 12 Output	B6	A3	21 (X1a)
Ch 11/Ch 12, L1 -	A6	-	-

Table 86. DO818 Process Connections (Continued)

Process Connection	TU830	TU818	TU819
Ch 13 Output	C7	D4	9 (X1a)
Ch 14 Output	B7	C4	22 (X1a)
Ch 13/Ch 14, L1 -	A7	-	-
Ch 15 Output	C8	B4	10 (X1a)
Ch 16 Output	B8	A4	23 (X1a)
Ch 15/Ch 16, L1 -	A8	-	-
Ch 17 Output	C9	D5	3 (X1b)
Ch 18 Output	B9	C5	16 (X1b)
Ch 17/Ch 18, L2 -	A9	-	-
Ch 19 Output	C10	B5	4 (X1b)
Ch 20 Output	B10	A5	17 (X1b)
Ch 19/Ch 20, L2 -	A10	-	-
Ch 21 Output	C11	D6	5 (X1b)
Ch 22 Output	B11	C6	18 (X1b)
Ch 21/Ch 22, L2 -	A11	-	-
Ch 23 Output	C12	B6	6 (X1b)
Ch 24 Output	B12	A6	19 (X1b)
Ch 23/Ch 24, L2 -	A12	-	-
Ch 25 Output	C13	D7	7 (X1b)
Ch 26 Output	B13	C7	20 (X1b)
Ch 25/Ch 26, L2 -	A13	-	-
Ch 27 Output	C14	B7	8 (X1b)

Table 86. DO818 Process Connections (Continued)

Process Connection	TU830	TU818	TU819
Ch 28 Output	B14	A7	21 (X1b)
Ch 27/Ch 28, L2 -	A14	-	-
Ch 29 Output	C15	D8	9 (X1b)
Ch 30 Output	B15	C8	22 (X1b)
Ch 29/Ch 30, L2 -	A15	-	-
Ch 31 Output	C16	B8	10 (X1b)
Ch 32 Output	B16	A8	23 (X1b)
Ch 31/Ch 32, L2 -	A16	-	-
+24 V d.c.	L2+ (2)	L2+ (2)	1, 14, 11, 24 (X1b)
0 V d.c.	L2- (2)	L2- (2)	2, 15, 12, 25 (X1b)

Figure 187 shows the Field connection example with TU830 Extended Module Termination Unit.

\* FUSE max 6,3A due to limitation in UL standards.

Figure 188 shows Field connection example with TU818 Compact Module Termination Unit.

Figure 189 shows Field connection example with TU819 Compact Module Termination Unit.



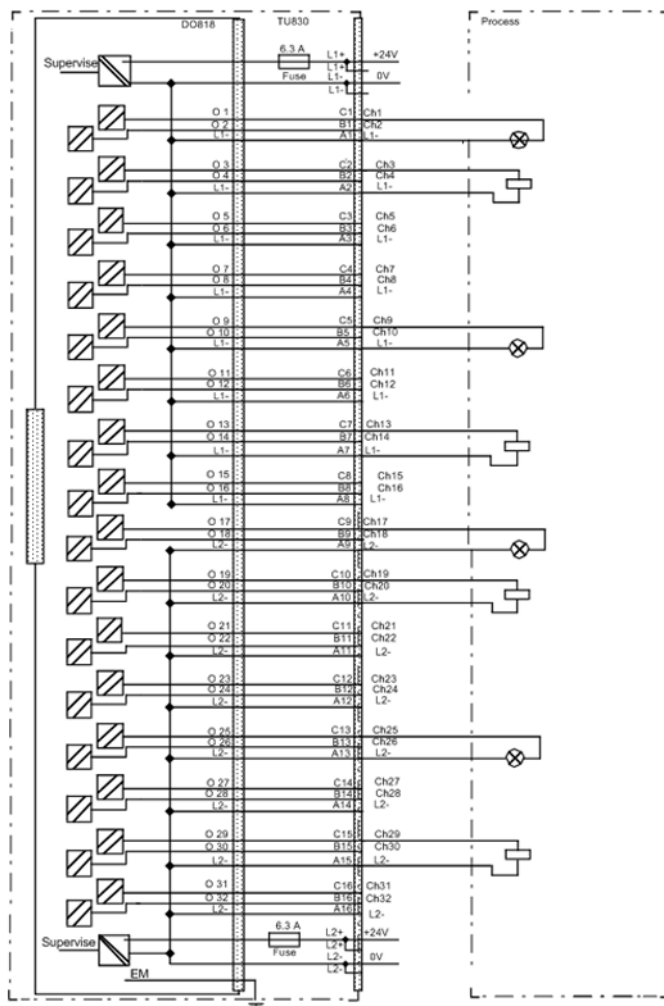


Figure 187. Field connection example with TU830 Extended Module Termination Unit

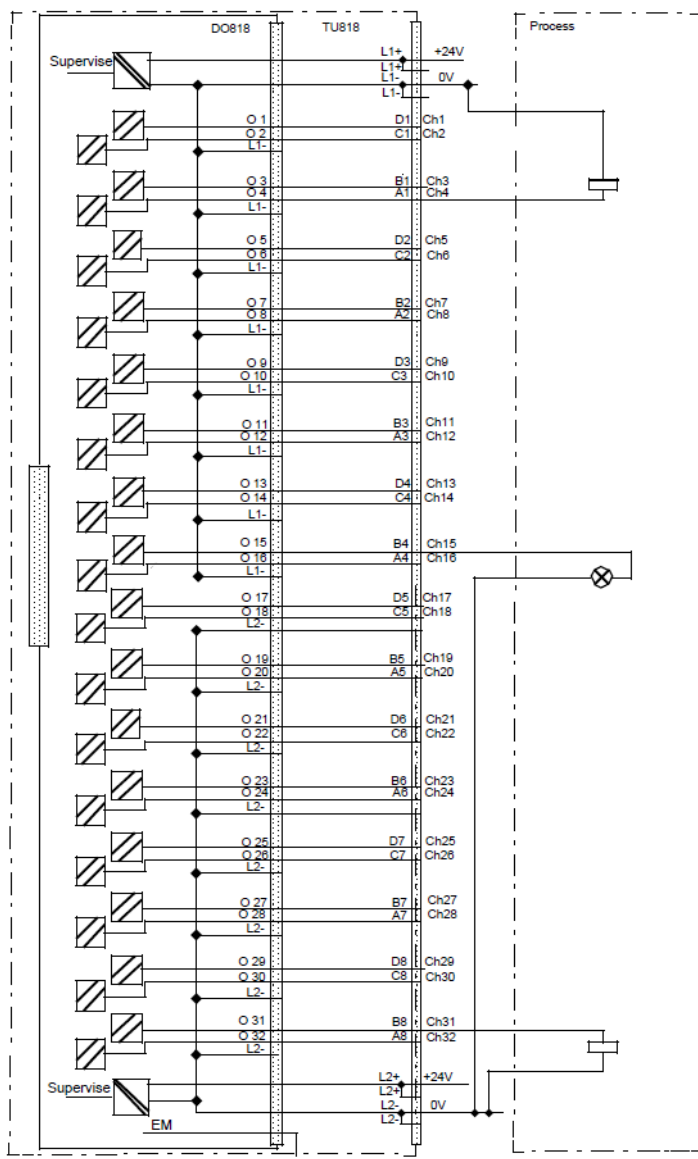
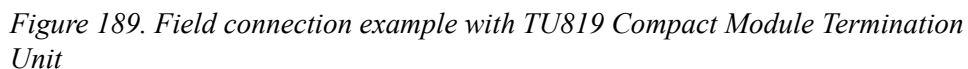


Figure 188. Field connection example with TU818 Compact Module Termination Unit



## DO820 Digital Output Module, Relay Normally Open

### Features

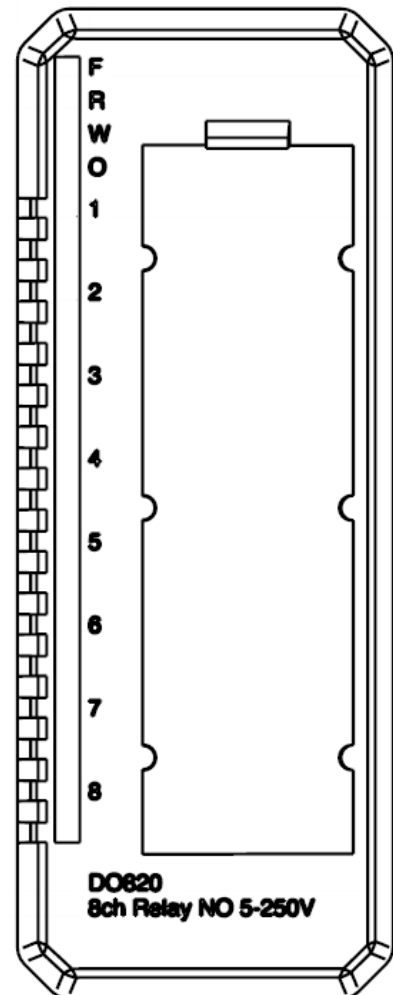
- 8 channels for 230 V a.c./d.c. relay Normal Open (NO) outputs.
- 8 isolated channels.
- Output status indicators.
- OSP sets outputs to predetermined state upon error detection.

### Description

The DO820 is an 8 channel 230 V a.c./d.c. relay (NO) output module for the S800 I/O. The maximum output voltage is 250 V a.c./d.c. and the maximum continuous output current per channel is 3 A. All outputs are individually isolated.

Each output channel consists of optical isolation barrier, output state indication LED, relay driver, relay and EMC protection components.

The relay supply voltage supervision, derived from the 24 V distributed on the ModuleBus, gives an error signal if the voltage disappears, and the Warning LED turns on. The error signal can be read through the ModuleBus. This supervision can be enabled/disabled with a parameter.



Six different types of MTUs can be used. The TU831/TU851 Extended MTU, TU811 Compact MTU, and TU813 Compact MTU enable two wire connection to the devices without additional terminals. The extended MTUs, TU836, provides an individual fuse (3 A max.) per channel on the load outlet terminals. The extended MTUs, TU837, provides an individual fuse (3 A max.) per channel. Outputs can be individually isolated or grouped by bridging. Signal return terminals are provided in two groups of four terminals.

### Technical Data

*Table 87. DO820 Digital Output Module Specifications*

Feature	DO820 Digital Output Module
Number of channels	8
Type of output	Relay (NO)
Voltage range	5 - 250 V a.c./d.c.
Load current, maximum	3 A
Load current, minimum	5 mA
Max. make current	30 A, 200ms, L/R >10 ms
Max break power	a.c. 720 VA @ power factor > 0.4, d.c. 40 W L/R ≤ 40 ms
Maximum field cable length (d.c., a.c.)	600 meters (656 yd.)
Pick-up time, maximum	9 ms
Release time, maximum	5 ms
Number of operations per hour, maximum	2000
Number of operations per lifetime:	
Mechanical	>20 x 10 <sup>6</sup>
Electrical	>1 x 10 <sup>6</sup>

Table 87. DO820 Digital Output Module Specifications (Continued)

Feature	DO820 Digital Output Module
Current consumption 5 V (Modulebus)	60 mA
Current consumption 24 V (Modulebus)	140 mA
Power dissipation <sup>(1)</sup>	2.9 W
Output Set as Predetermined (OSP) timer	256 <sup>(2)</sup> , 512, 1024 ms
Power supervision	24/12 V Relay power converter monitor
Isolation	Individually isolated from ground
Module termination units	TU811, TU813, TU831, TU836, TU837, or TU851
MTU keying code	AD
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated.

(2) 256 ms are used for Master. Set by the user for MOD.

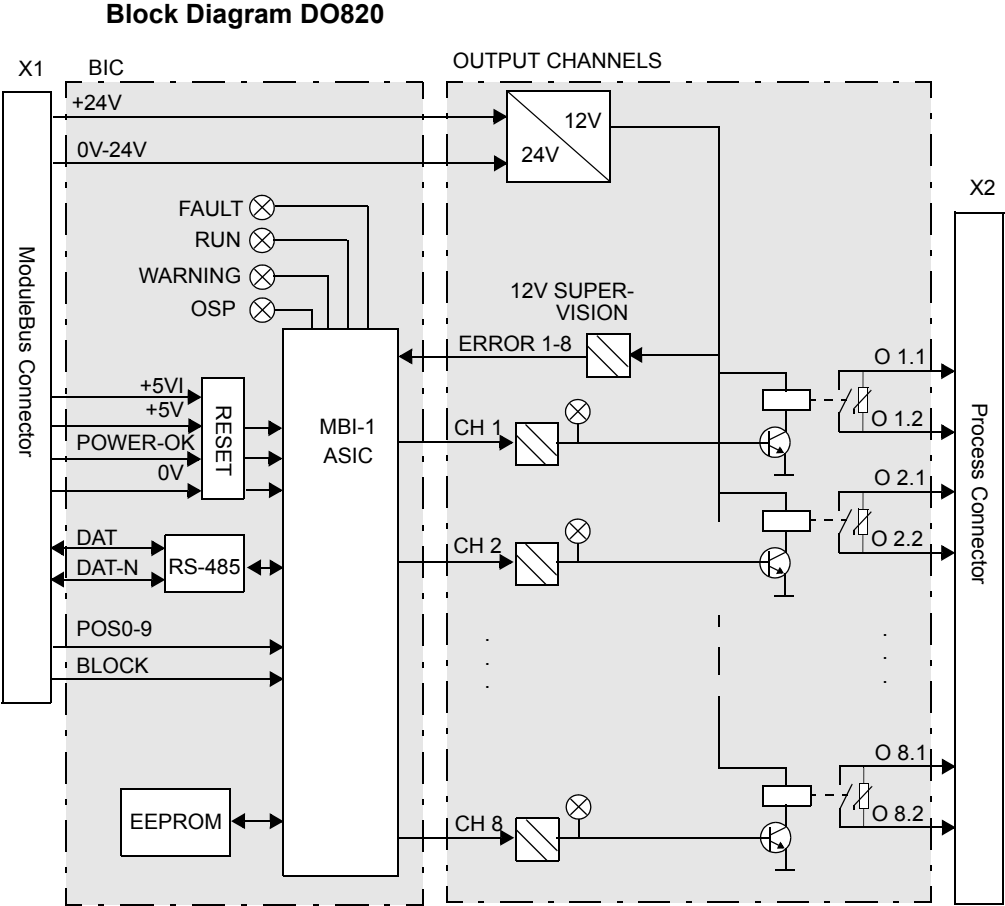


Figure 190. DO820 Block Diagram

**Process Connections***Table 88. DO820 Process Connections*

<b>Process Connection</b>	<b>TU811/TU813 Terminal</b>	<b>TU831 Terminal</b>	<b>TU836 Terminal</b>	<b>TU837 Terminal</b>	<b>TU851 Terminal</b>
Ch 1.1 Output	B1	B1	11 (fused)	B1	B2
Ch 1.2 Output	A1	A1	12	A1 (fused)	A2
Ch 2.1 Output	C2	B2	21 (fused)	B2	B4
Ch 2.2 Output	A2	A2	22	A2 (fused)	A4
Ch 3.1 Output	B3	B3	31 (fused)	B3	B6
Ch 3.2 Output	A3	A3	32	A3 (fused)	A6
Ch 4.1 Output	C4	B4	41 (fused)	B4	B8
Ch 4.2 Output	A4	A4	42	A4 (fused)	A8
Ch 5.1 Output	B5	B5	51 (fused)	B5	B10
Ch 5.2 Output	A5	A5	52	A5 (fused)	A10
Ch 6.1 Output	C6	B6	61 (fused)	B6	B12
Ch 6.2 Output	A6	A6	62	A6 (fused)	A12
Ch 7.1 Output	B7	B7	71 (fused)	B7	B14
Ch 7.2 Output	A7	A7	72	A7 (fused)	A14
Ch 8.1 Output	C8	B8	81 (fused)	B8	B16
Ch 8.2 Output	A8	A8	82	A8 (fused)	A16
Process Power Source 1	-	-	L1, N1	N1, N1, 11, 12, 13, 14	-
Process Power Source 2	-	-	L2, N2	N2, N2, 25, 26, 27, 28	-



Figure 191 shows the process connections for the Digital Output Module DO820 when installed on a TU831 Extended MTU.

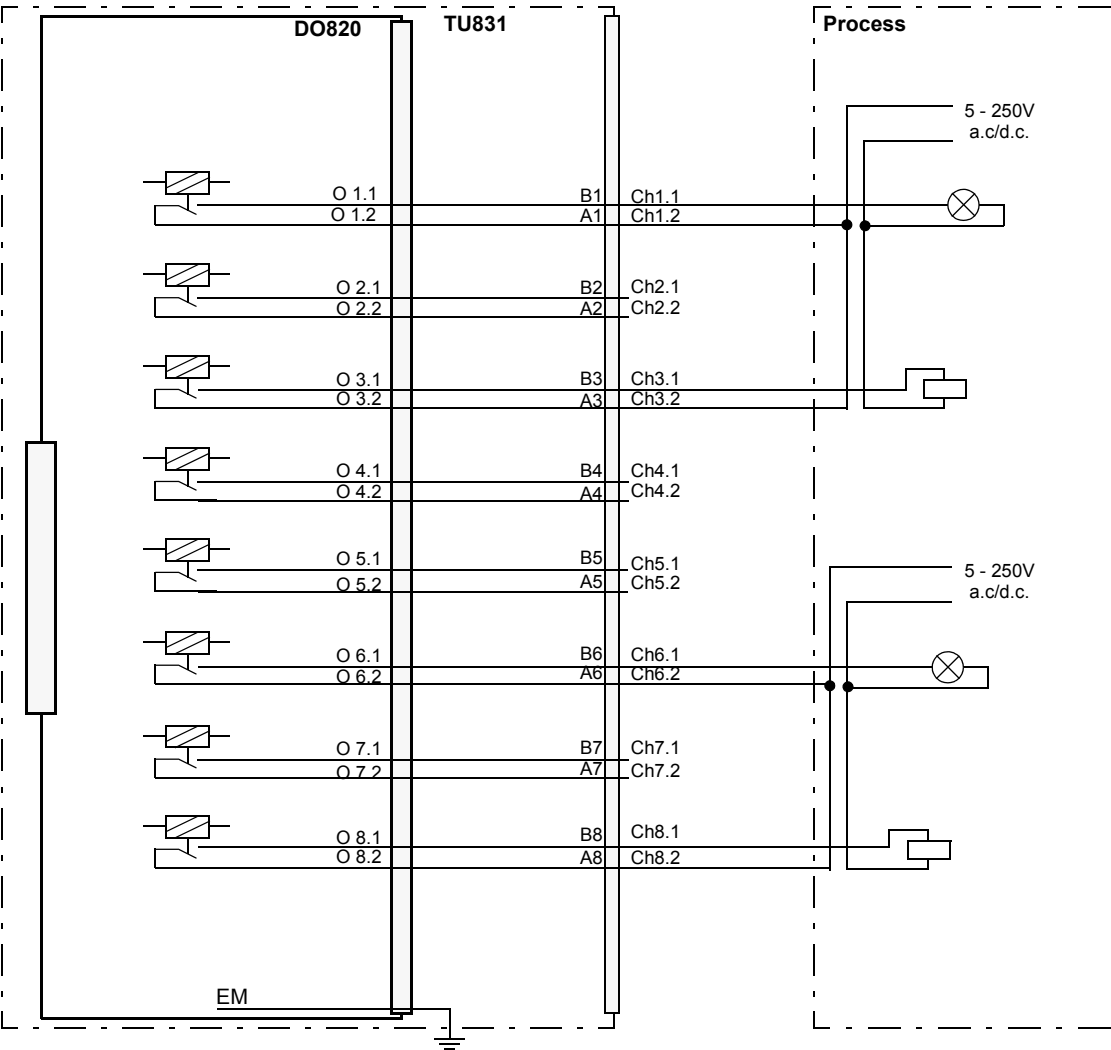


Figure 191. DO820 with TU831 Extended MTU Process Connections

Figure 192 shows the process connections for the DO820 when installed on a TU811 or TU813 Compact MTU.

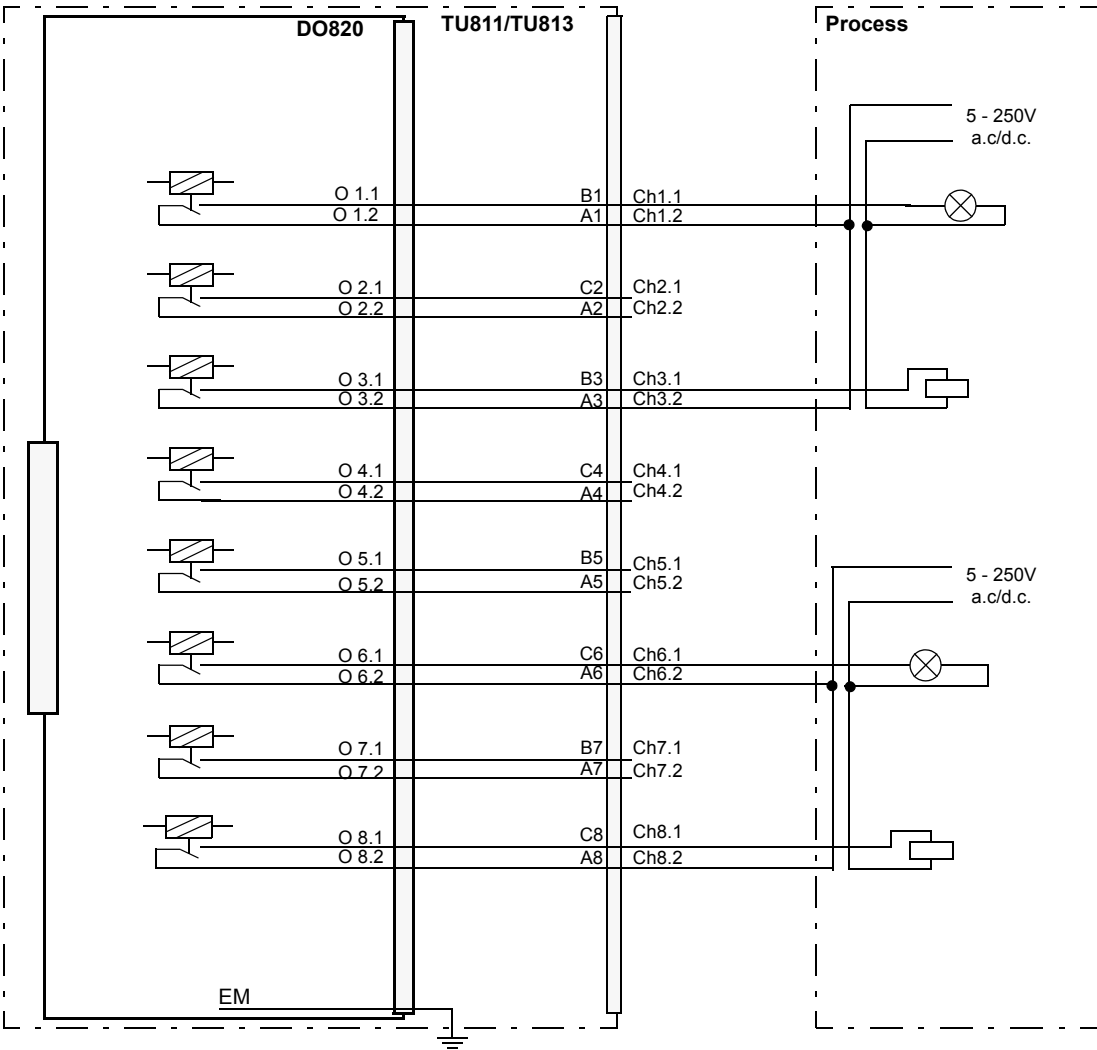


Figure 192. DO820 with TU811 or TU813 Compact MTU Process Connections

Figure 193 shows the process connections for the DO820 when installed on a TU836 Extended MTU.

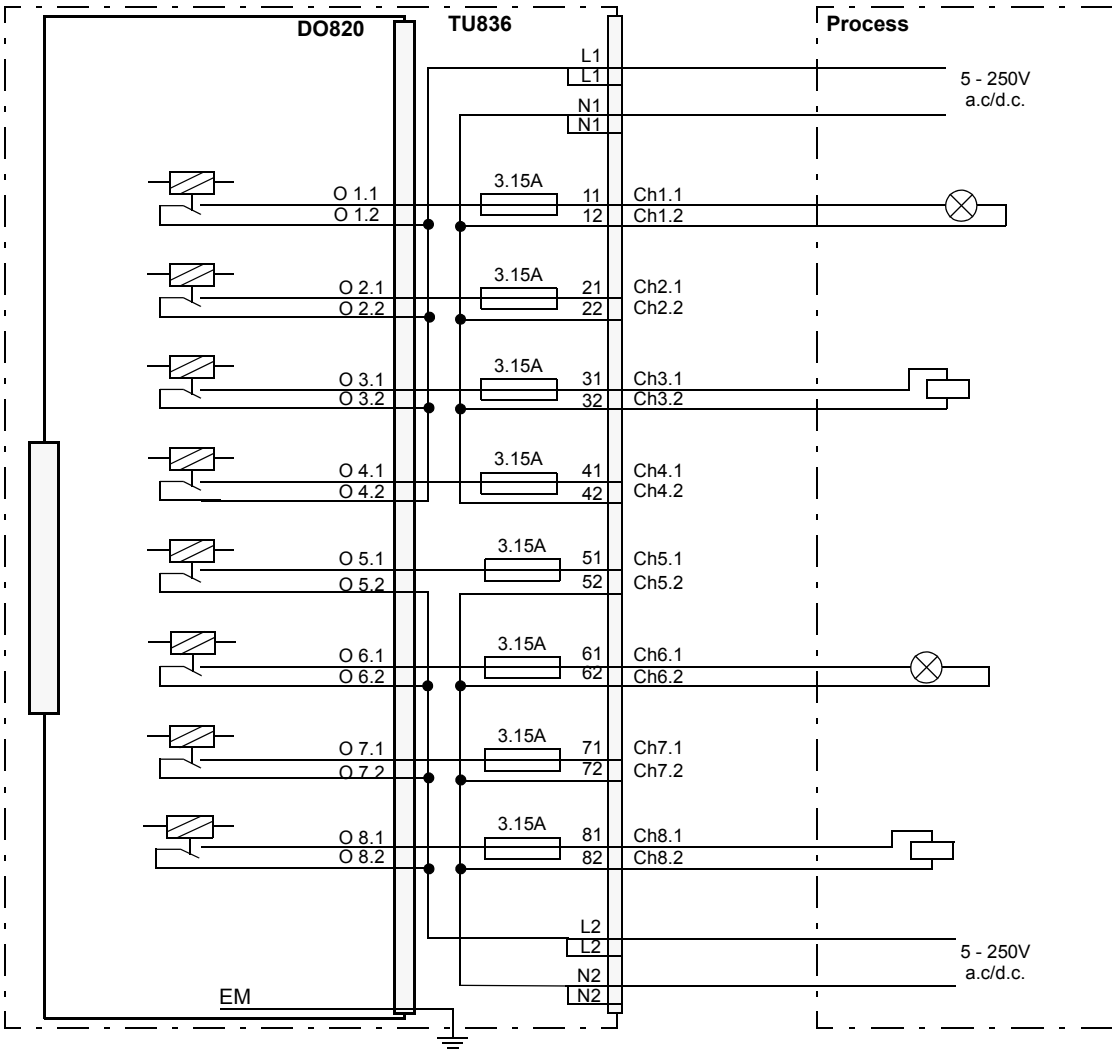


Figure 193. DO820 with TU836 Extended MTU Process Connections

Figure 194 shows the process connections for the DO820 when installed on a TU837 Extended MTU.

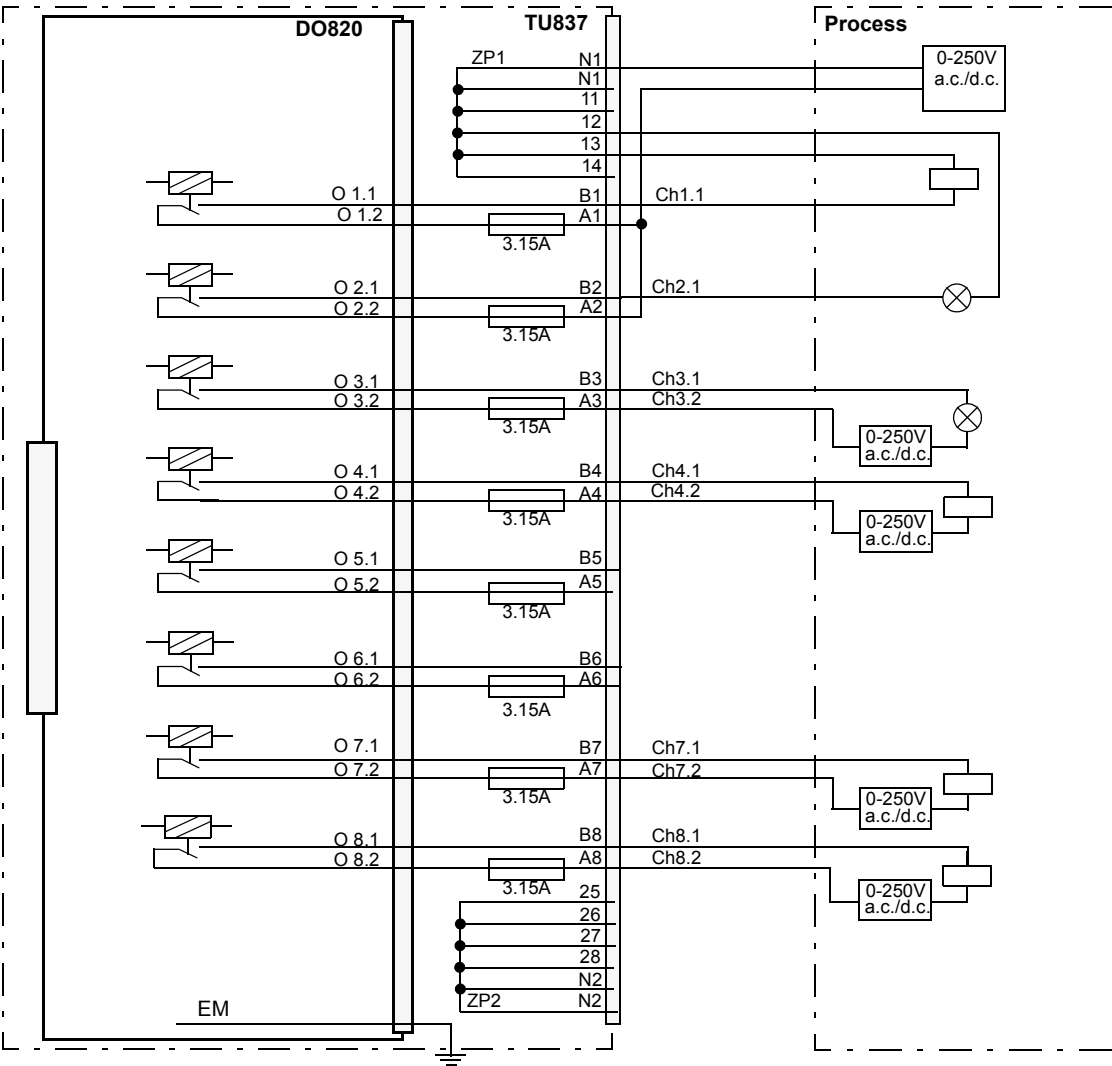


Figure 194. DO820 with TU837 Extended MTU Process Connections

Figure 195 shows the process connections for the DO820 when installed on a TU851 Extended MTU.

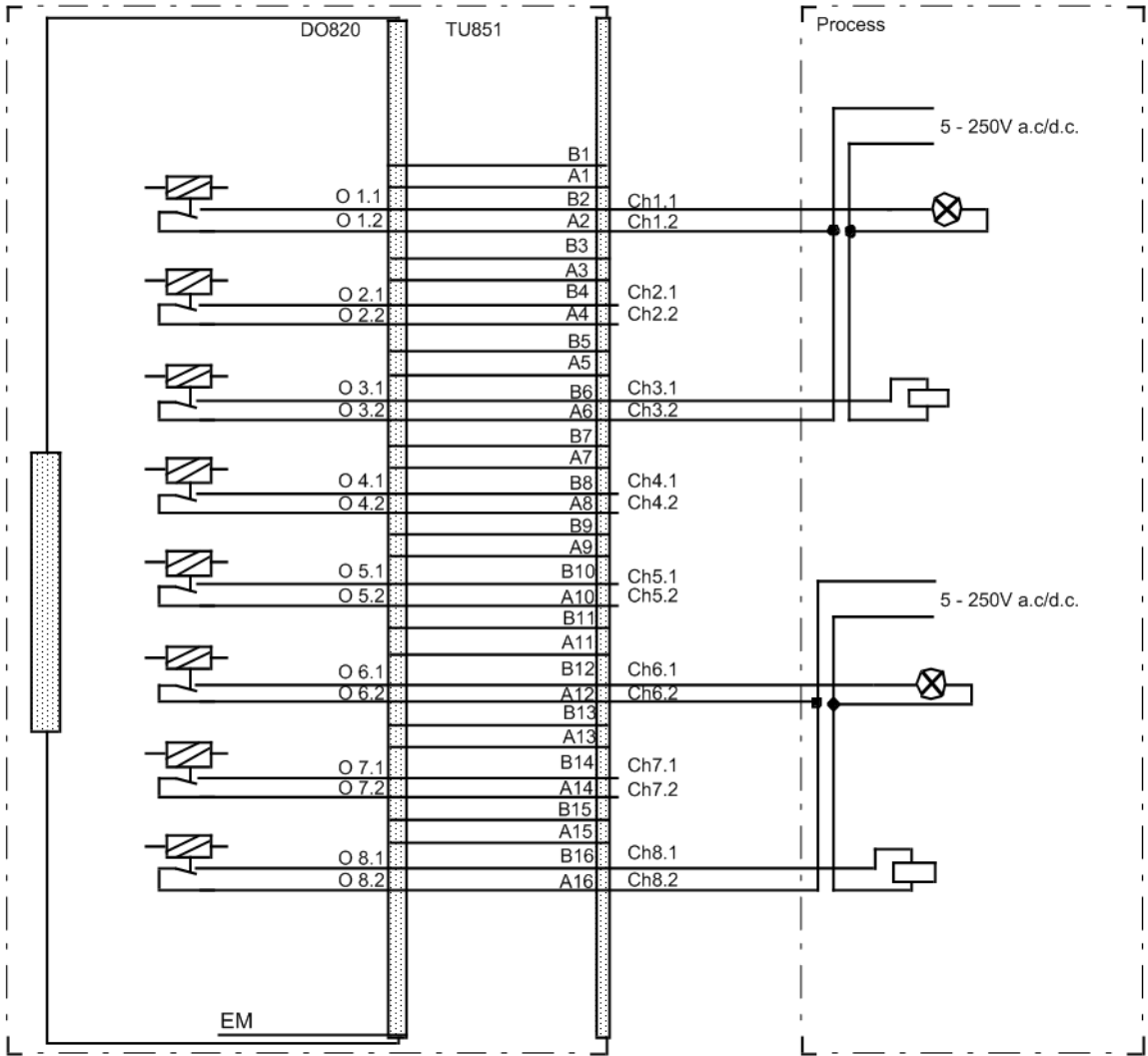


Figure 195. DO820 with TU851 Extended MTU Process Connections

## DO821 Digital Output Module, Relay Normally Closed

### Features

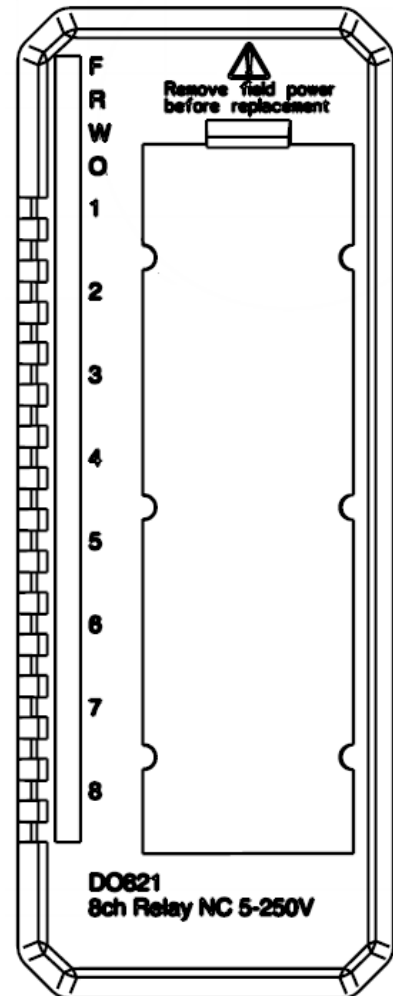
- 8 channels for 230 V a.c./d.c. relay Normal Closed (NC) outputs.
- 8 isolated channels.
- Output status indicators.
- OSP sets outputs to predetermined state upon error detection.

### Description

The DO821 is an 8 channel 230 V a.c./d.c. relay (NC) output module for the S800 I/O. The maximum output voltage is 250 V a.c. and the maximum continuous output current per channel is 3 A. All outputs are individually isolated.

Each output channel consists of optical isolation barrier, output state indication LED, relay driver, relay and EMC protection components.

The relay supply voltage supervision, derived from the 24 V distributed on the ModuleBus, gives an error signal if the voltage disappears, and the Warning LED turns on. The error signal can be read via the ModuleBus. This supervision can be enabled/disabled with a parameter.



Six different types of MTUs can be used. The TU831/TU851 Extended MTU, TU811 Compact MTU, and TU813 Compact MTU enable two wire connection to the devices without additional terminals. The extended MTU, TU836, provides an individual fuse (3 A max.) per channel on the load outlet terminals. The extended MTU, TU837 provides an individual fuse (3 A max.) per channel. Outputs can be individually isolated or grouped by bridging. Signal return terminals are provided in two groups of four terminals.

### Technical Data

*Table 89. DO821 Digital Output Module Specifications*

Feature	DO821 Digital Output Module
Number of channels	8
Type of output	Relay (NC)
Voltage range	5 - 250 V a.c./d.c.
Load current, maximum	3 A
Load current, minimum	5 mA
Max. make current	30 A, 200ms, L/R >10 ms
Max break power	a.c. 720 VA @ power factor > 0.4, d.c. 40 W L/R ≤ 40 ms
Maximum field cable length (d.c., a.c.)	600 meters (656 yd.)
Pick-up time, maximum	9 ms
Release time, maximum	5 ms
Number of operations per hour, maximum	2000
Number of operations per lifetime:	
Mechanical	>20 x 10 <sup>6</sup>
Electrical	>1 x 10 <sup>6</sup>

Table 89. DO821 Digital Output Module Specifications (Continued)

Feature	DO821 Digital Output Module
Current consumption 5 V (Modulebus)	60 mA
Current consumption 24 V (Modulebus)	140 mA
Power dissipation <sup>(1)</sup>	2.9 W
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Power supervision	24/12 V Relay power converter monitor
Isolation	Individually isolated from ground (RIV=250 V)
Module termination units	TU811, TU813, TU831, TU836, TU837, or TU851
MTU keying code	CA
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.

(1) Power dissipation is calculated with 70 percent of the channels activated.



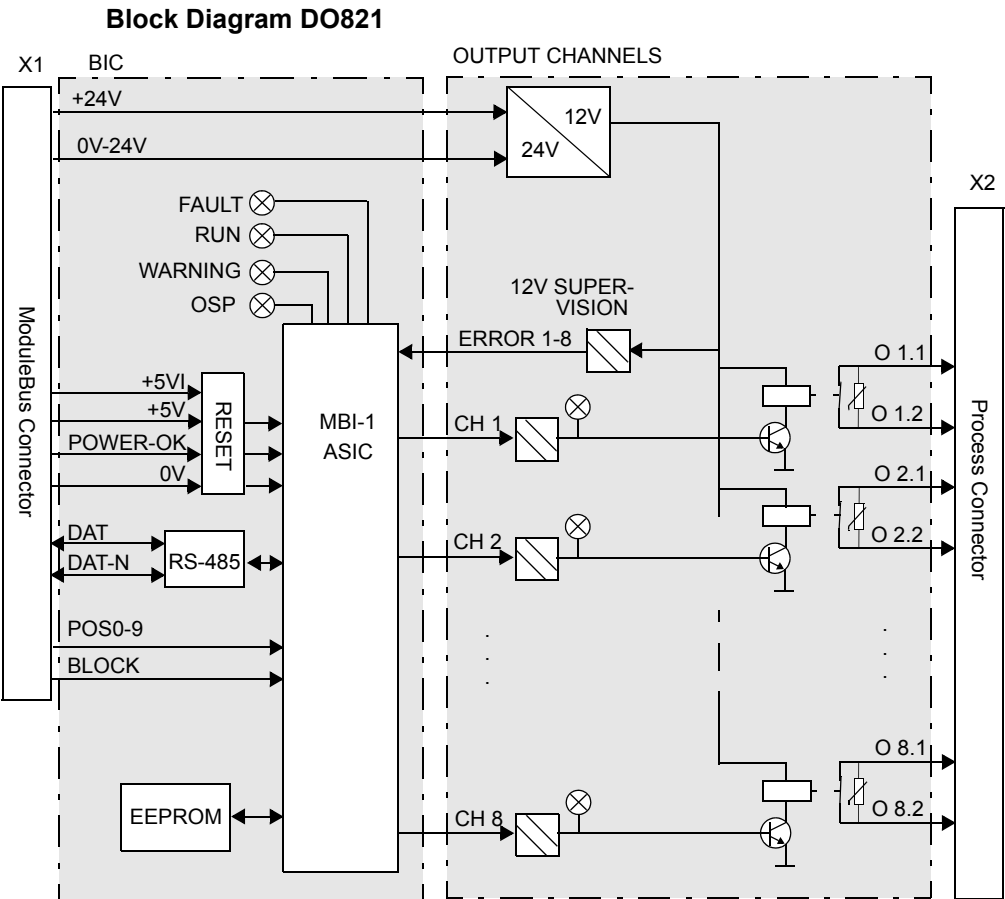


Figure 196. DO821 Block Diagram

**Process Connections***Table 90. DO821 Process Connections*

<b>Process Connection</b>	<b>TU811/TU813 Terminal</b>	<b>TU831 Terminal</b>	<b>TU836 Terminal</b>	<b>TU837 Terminal</b>	<b>TU851 Terminal</b>
Ch 1.1 Output	B1	B1	11 (fused)	B1	B2
Ch 1.2 Output	A1	A1	12	A1 (fused)	A2
Ch 2.1 Output	C2	B2	21 (fused)	B2	B4
Ch 2.2 Output	A2	A2	22	A2 (fused)	A4
Ch 3.1 Output	B3	B3	31 (fused)	B3	B6
Ch 3.2 Output	A3	A3	32	A3 (fused)	A6
Ch 4.1 Output	C4	B4	41 (fused)	B4	B8
Ch 4.2 Output	A4	A4	42	A4 (fused)	A8
Ch 5.1 Output	B5	B5	51 (fused)	B5	B10
Ch 5.2 Output	A5	A5	52	A5 (fused)	A10
Ch 6.1 Output	C6	B6	61 (fused)	B6	B12
Ch 6.2 Output	A6	A6	62	A6 (fused)	A12
Ch 7.1 Output	B7	B7	71 (fused)	B7	B14
Ch 7.2 Output	A7	A7	72	A7 (fused)	A14
Ch 8.1 Output	C8	B8	81 (fused)	B8	B16
Ch 8.2 Output	A8	A8	82	A8 (fused)	A16
Process Power Source 1	-	-	L1, N1	N1, N1, 11, 12, 13, 14	-
Process Power Source 2	-	-	L2, N2	N2, N2, 25, 26, 27, 28	-

Figure 197 shows the process connections for the Digital Output Module DO821 when installed on a TU831 Extended MTU.

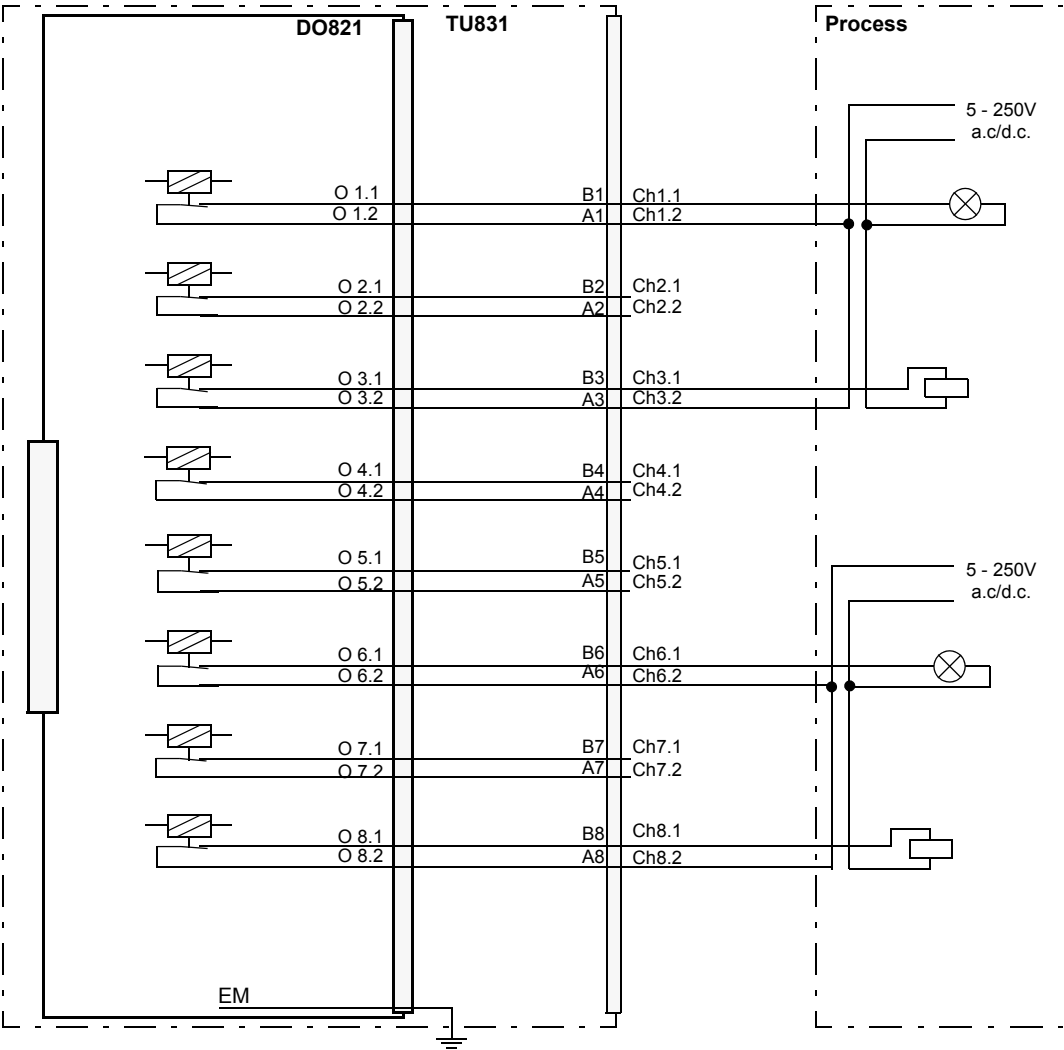


Figure 197. DO821 with TU831 Extended MTU Process Connections

Figure 198 shows the process connections for the DO821 when installed on a TU811 or TU813 Compact MTU.

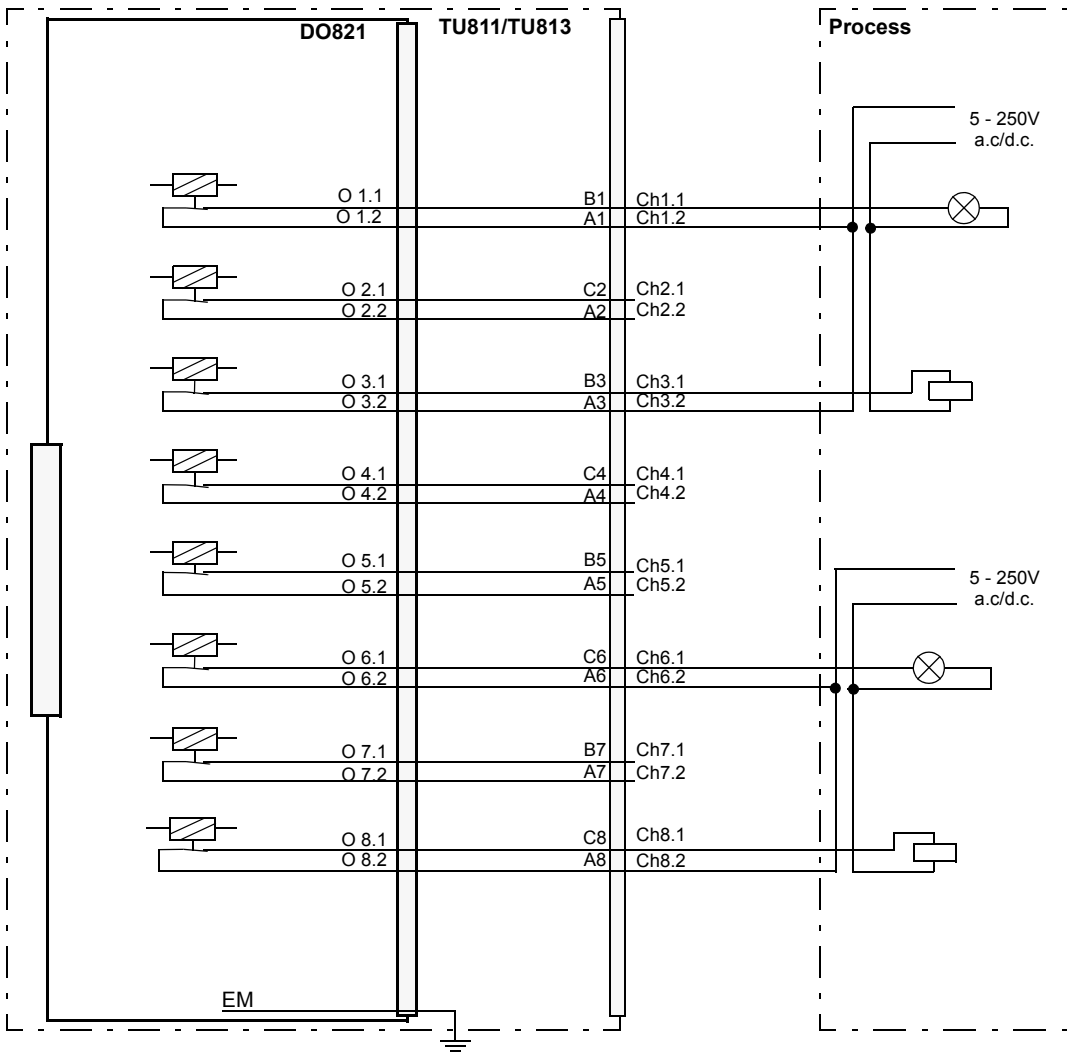


Figure 198. DO821 with TU811 or TU813 Compact MTU Process Connections

Figure 199 shows the process connections for the DO821 when installed on a TU836 Extended MTU.

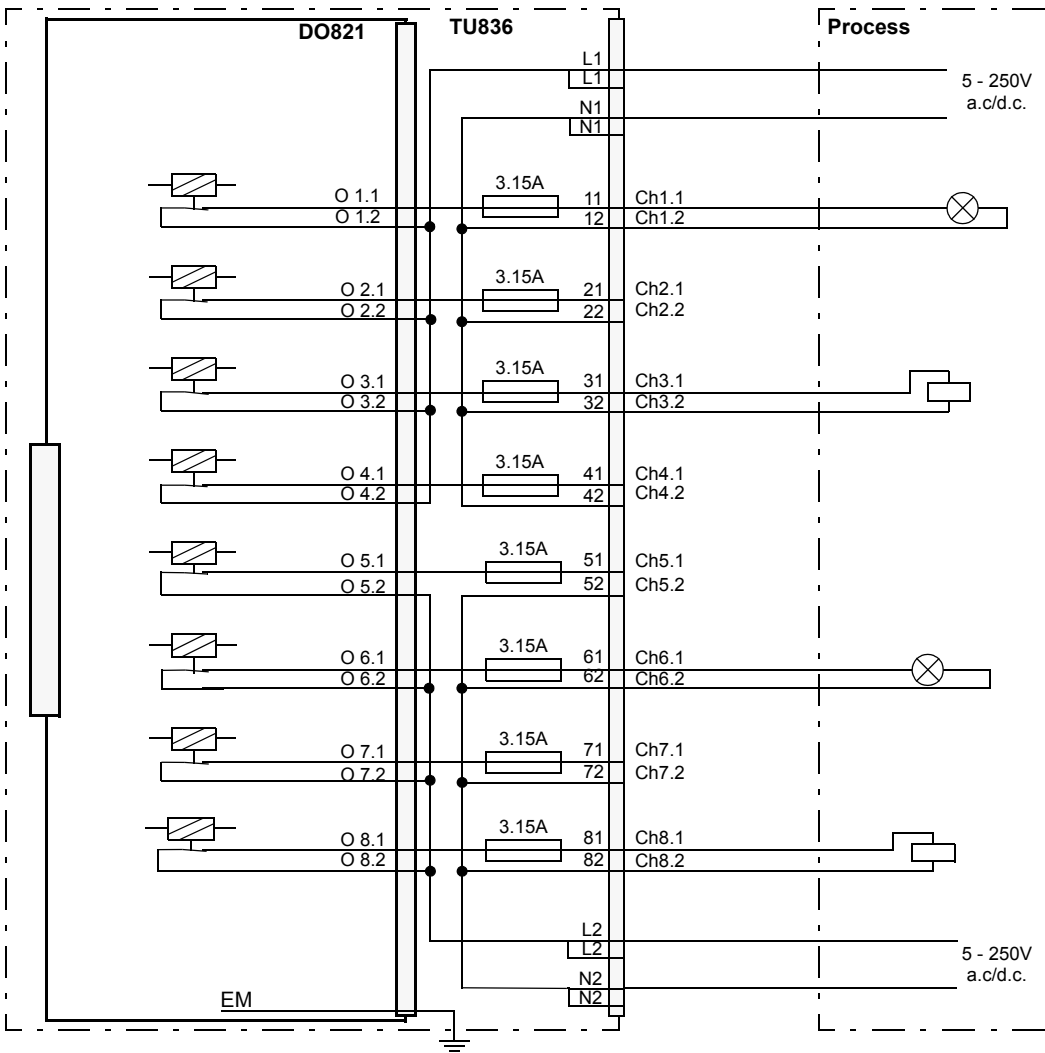


Figure 199. DO821 with TU836 Extended MTU Process Connections

Figure 200 shows the process connections for the DO821 when installed on a TU837 Extended MTU.

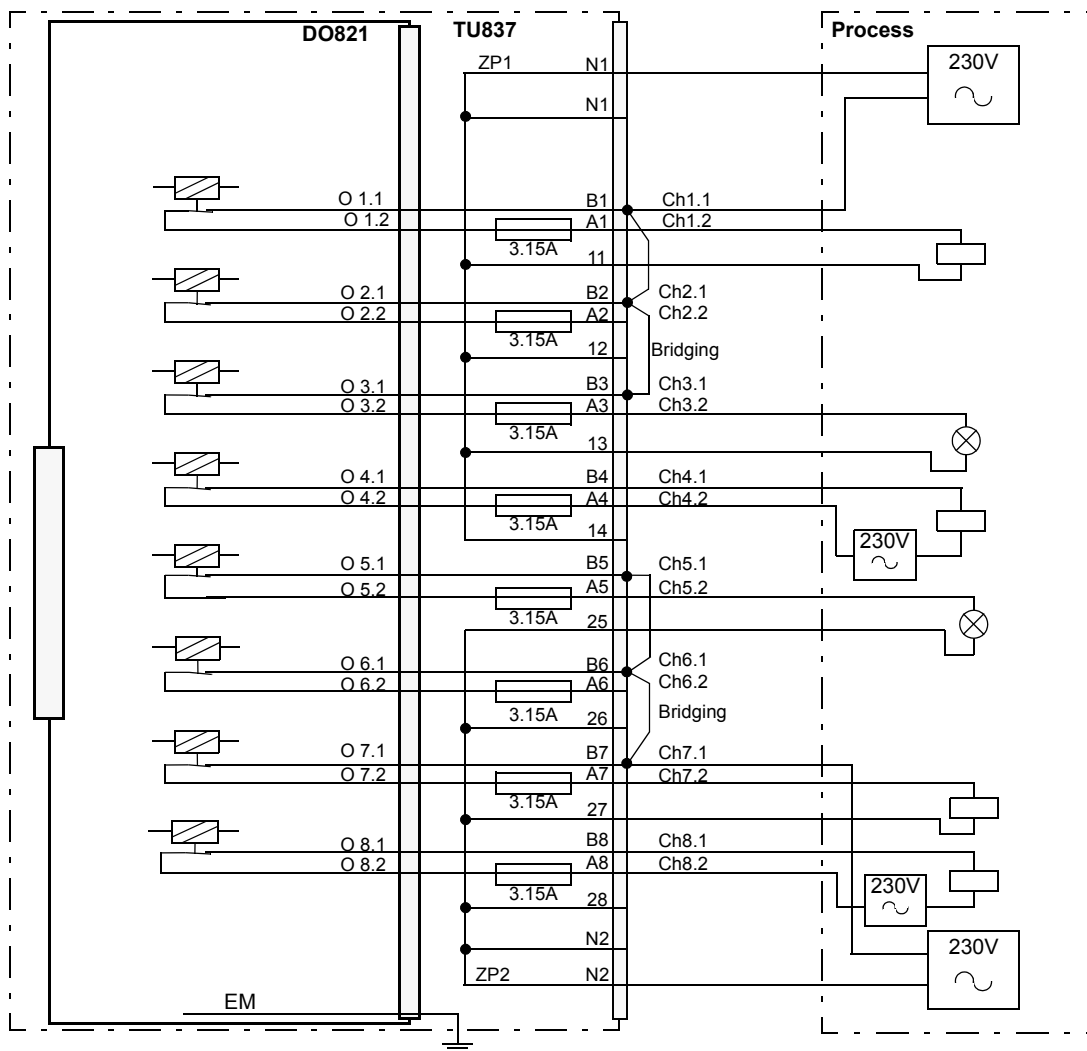


Figure 200. DO821 with TU837 Extended MTU Process Connections

Figure 201 shows the process connections for the DO821 when installed on a TU851 Extended MTU.

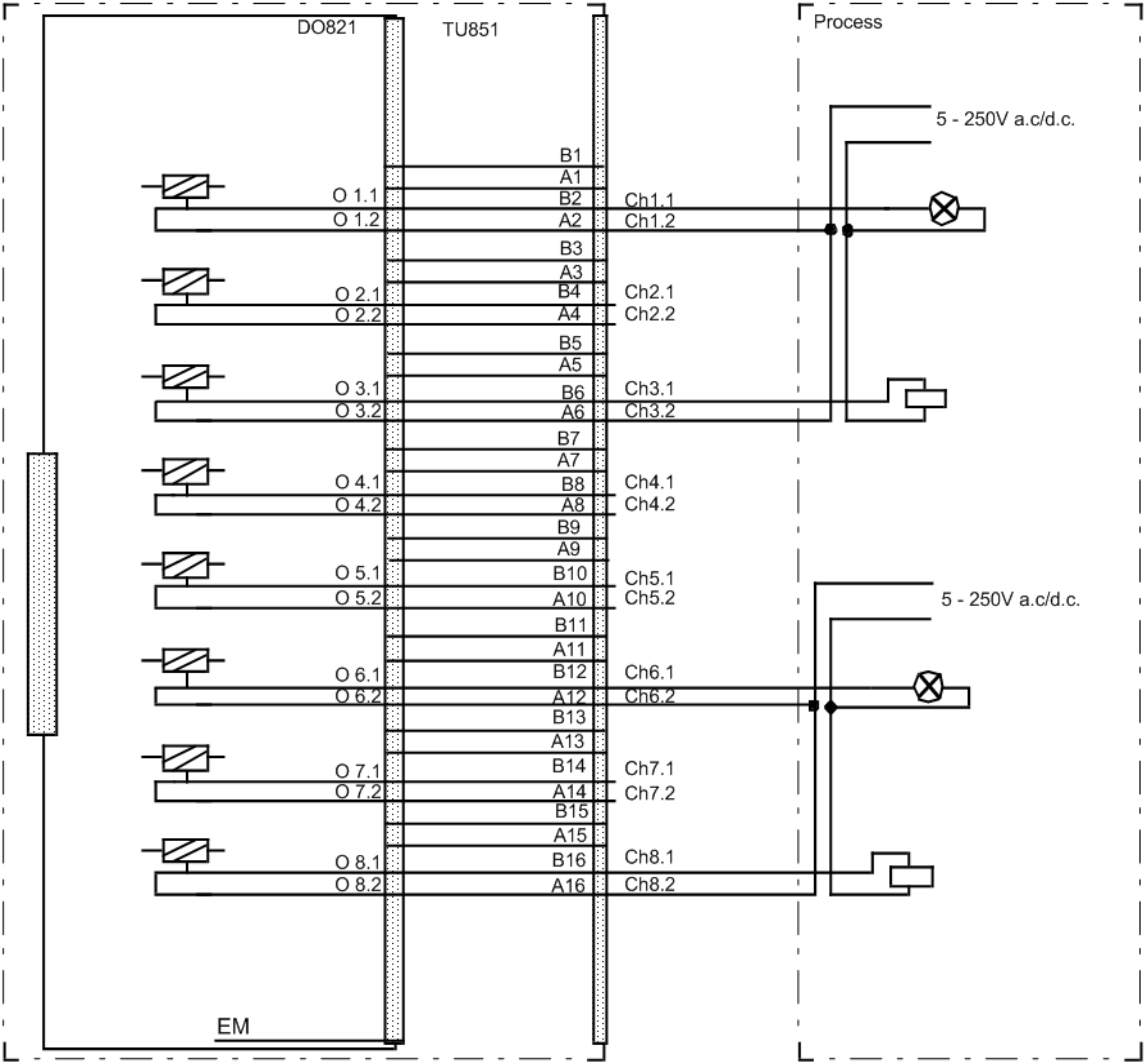


Figure 201. DO821 with TU851 Extended MTU Process Connections

## DO828 Digital Output Module, Relay Normally Open

### Features

- 16 channels for 125V d.c. / 250V a.c. relay outputs.
- 16 isolated channels.
- Output status indicators.
- OSP sets outputs to predetermined state upon error detection.

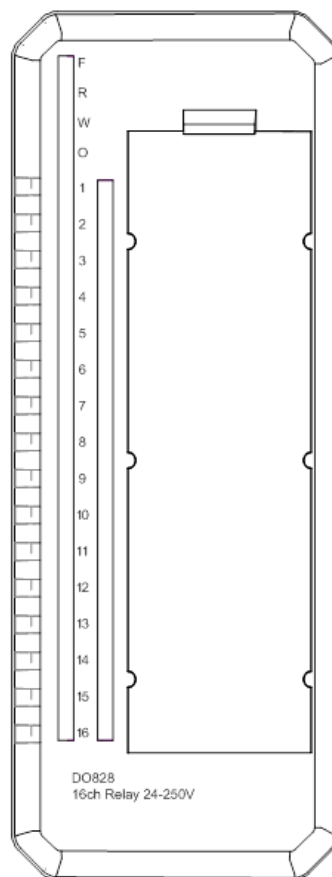
### Description

The DO828 is an 16 channel 125V d.c. / 250V a.c. relay output module for the S800 I/O. The maximum output voltage is 125V d.c. / 250V a.c. and the maximum continuous output current per channel is 2 A. All outputs are individually isolated.

Each output channel consists of optical isolation barrier, output state indication LED, relay driver, relay and EMC protection components.

The relay supply voltage supervision, derived from the 12 V distributed on the ModuleBus, gives an error signal if the voltage disappears, and the Warning LED turns on. The error signal can be read through the ModuleBus. This supervision can be enabled/disabled with a parameter.

DO828 can be used on the Extended MTU TU851. The TU851 Extended MTU provides two terminals per channel.





**Technical Data***Table 91. DO828 Digital Output Module Specifications*

<b>Feature</b>	<b>DO828 Digital Output Module</b>
Number of channels	16
Type of output	Relay (NO)
Voltage range	5-250V a.c. / 5-125V d.c.
Load current, maximum	2 A
Load current, minimum	5 mA
Max. make current	30 A, 50ms, resistive
Max break power	a.c. 500VA d.c 60W
Maximum field cable length (d.c., a.c.)	600 meters (656 yd.)
Pick-up time, maximum	10 ms
Release time, maximum	5 ms
Number of operations per hour, maximum	2000
Number of operations per lifetime:	
Mechanical	$>20 \times 10^6$
Electrical at 30 V d.c. / 250 V a.c.	$>0,16 \times 10^6$ (2 A resistive)
Current consumption 5 V (Modulebus)	45 mA
Current consumption 24 V (Modulebus)	80 mA
Power dissipation <sup>(1)</sup>	3.5 W
Output Set as Predetermined (OSP) timer	256 <sup>(2)</sup> , 512, 1024 ms
Power supervision	12 V Relay power converter monitor

Table 91. DO828 Digital Output Module Specifications (Continued)

Feature	DO828 Digital Output Module
Isolation	Channel wise isolated (RIV 250)
Module termination units	TU851
MTU keying code	ED
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.

- (1) Power dissipation is calculated with 70 percent of the channels activated.  
(2) 256 ms are used for Master. Set by the user for MOD.

Block Diagram DO828

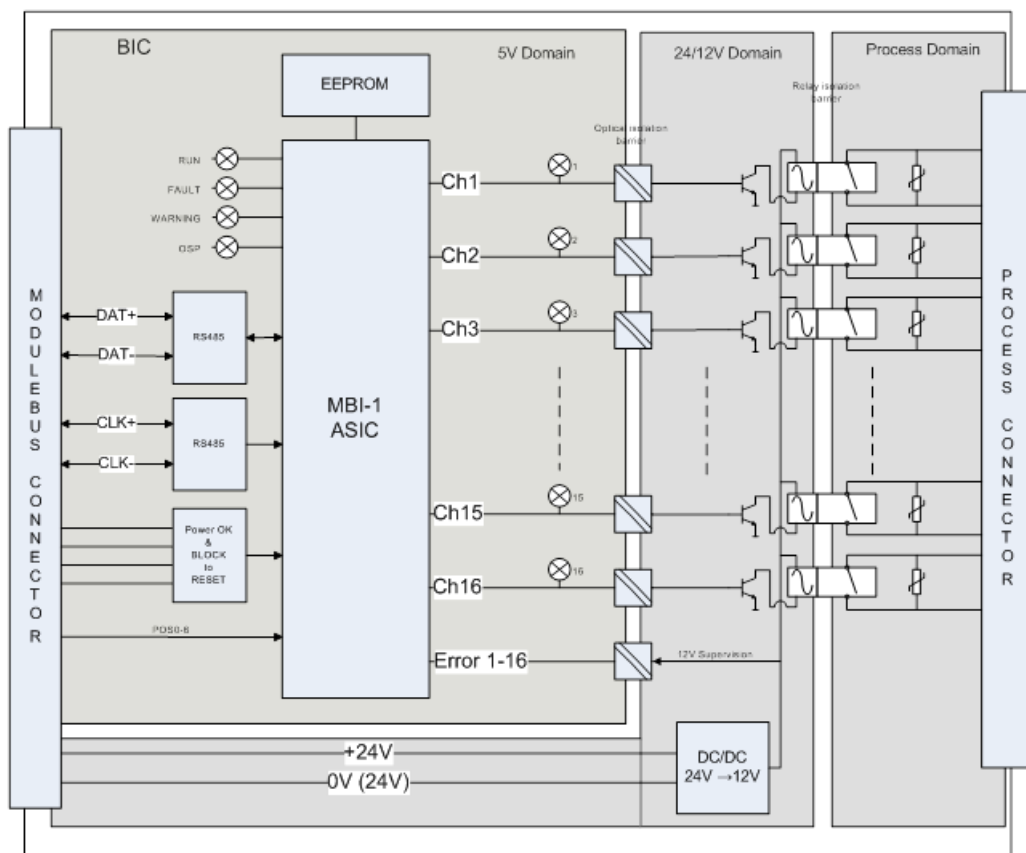


Figure 202. DO828 Block Diagram

**Process Connections**

*Table 92. DO828 Process Connections*

<b>Process Connection</b>	<b>TU851 Terminal</b>
Ch 1.1 Output	B1
Ch 1.2 Output	A1
Ch 2.1 Output	B2
Ch 2.2 Output	A2
Ch 3.1 Output	B3
Ch 3.2 Output	A3
Ch 4.1 Output	B4
Ch 4.2 Output	A4
Ch 5.1 Output	B5
Ch 5.2 Output	A5
Ch 6.1 Output	B6
Ch 6.2 Output	A6
Ch 7.1 Output	B7
Ch 7.2 Output	A7
Ch 8.1 Output	B8
Ch 8.2 Output	A8
Ch 9.1 Output	B9
Ch 9.2 Output	A9
Ch 10.1 Output	B10
Ch 10.2 Output	A10

*Table 92. DO828 Process Connections (Continued)*

<b>Process Connection</b>	<b>TU851 Terminal</b>
Ch 11.1 Output	B11
Ch 11.2 Output	A11
Ch 12.1 Output	B12
Ch 12.2 Output	A12
Ch 13.1 Output	B13
Ch 13.2 Output	A13
Ch 14.1 Output	B14
Ch 14.2 Output	A14
Ch 15.1 Output	B15
Ch 15.2 Output	A15
Ch 16.1 Output	B16
Ch 16.2 Output	A16



## DO840 Digital Output Module

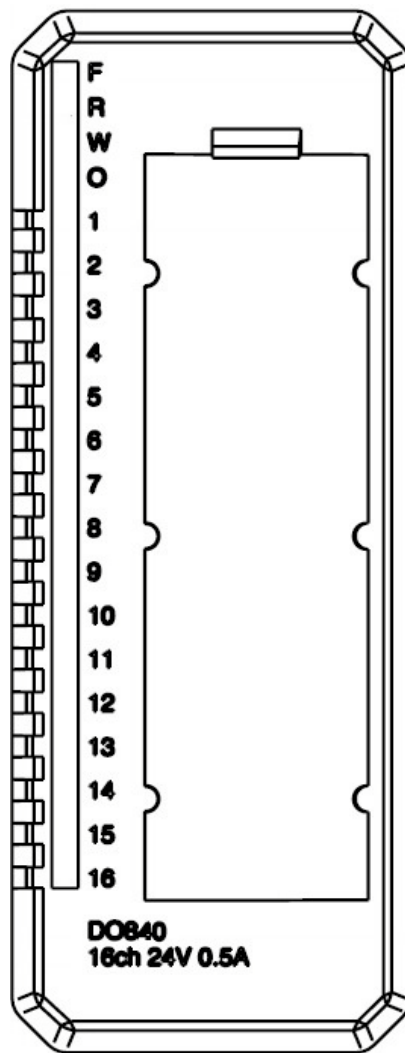
### Features

- 16 channels for 24 V d.c. current sourcing outputs.
- 2 isolated groups of 8 channels with process voltage supervision.
- Advanced on-board diagnostics.
- Output status indicators.
- OSP sets outputs to predetermined state upon error detection.
- Redundant or single applications.
- Current limited and over-temperature protection.

### Description

The DO840 is a 16 channel 24 V digital output module for single or redundant application. This module has 16 digital outputs. The maximum continuous output current per channel is 0.5 A. The outputs are current limited and protected against over temperature. The outputs are divided into two groups with eight output channels and one voltage supervision input in each group.

Each output channel consists of a current limited and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier.



In addition to the four module LEDs, DO840 has one LED (Yellow/Red) per channel (16) that indicate output state and channel error (Yellow = output is energized, Off = output is de-energized, Red = channel error).

External channel error is reported if process power is low and channel has over load. Internal channel error is reported if output driver or main power switch has failed. Module error is reported if internal power has failed or if internal communication link between the modules in redundant applications has failed.



The pulse tests inverts all outputs for the group for < 1ms in intervals of 100 ms. That will give a short pulse < 1ms on the output. The pulse tests can be enabled/disabled by parameter.

The outputs can be set in two different modes for handling of over load, automatic reset or latch on fault mode.

The outputs are current limited and protected against over temperature. If the outputs are overloaded the output current will be limited. In automatic reset mode the power dissipation in the output stage will increase and the output will shutdown if the temperature in the output stage increases above 150°C (302°F). The output will switch on again automatically as the component temperature has decreased to about 140°C (284°F). In Latch on Fault mode the outputs will switch off and stay so until the overload has disappeared and the fault is acknowledged. If any output is shutdown due to overload the indication LED on that channel is also switched to red.

Five different types of MTUs can be used for single applications. TU830/TU833 Extended MTU and TU810 (or TU814). The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant applications there are three types of MTUs, TU842/TU852 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.



**Technical Data***Table 93. DO840 Digital Output Module Specifications*

<b>Feature</b>	<b>DO840 Digital Output Module</b>
Number of channels	16 (2 x 8)
Type of output	Transistor current sourcing, current limited
Voltage range	19.2 - 32 V d.c.
Load current, maximum	0.5 A
Maximum continuous load current total per module	4A @ $\leq 40^{\circ}\text{C}$ 2A @ $\leq 55^{\circ}\text{C}$
Short circuit current per channel, maximum	2.5 A
Leakage current, maximum	$<10\ \mu\text{A}$
Loop monitoring	Short circuit detection in energized state.
On-state voltage drop	$\leq 0.3\ \text{V}$
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption 5 V (Modulebus)	130 mA
Current consumption 24 V (process power supply, UPx), no external load	200 mA
Power dissipation <sup>(1)</sup>	4.3 W
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group)
Isolation	Groupwise isolated from ground
Mounting termination units	TU810, TU812, TU814, TU830, TU833, TU842 or TU843 and TU852

Table 93. DO840 Digital Output Module Specifications (Continued)

Feature	DO840 Digital Output Module
MTU keying code	CE
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

(1) Power dissipation is calculated with 24 V and 4 A total load.

Block Diagram DO840

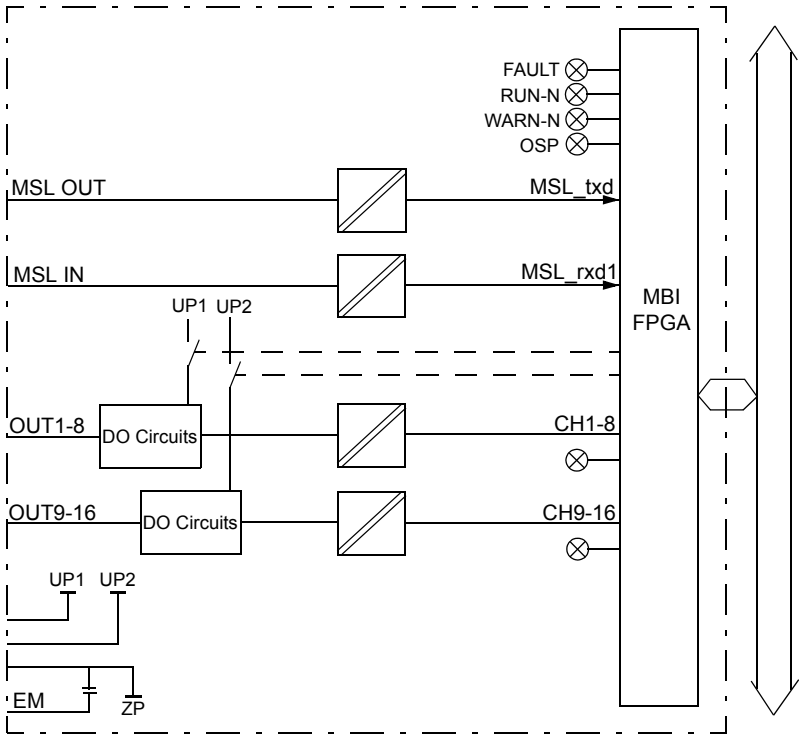


Figure 204. Block Diagram DO840

**Process Connections***Table 94. DO840 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 male Connector<sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>	<b>TU842 TU843 Terminal</b>	<b>TU852 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+	1, 14 (X1a and X1b)
0 V d.c.	L1-	2, 15	L1- (2)	L1-	2, 15 (X1a and X1b)
Ch 1/Ch 2, L1+	-	-	-	-	
Ch 1 Output	C1	3	C1	C1	3 (X1a)
Ch 2 Output	B1	16	C2	C2	16 (X1a)
Ch 1/Ch 2, L1-	A1	-	A1, A2	A1, A2	-
Ch 3/Ch 4, L1+	-	-	-	-	-
Ch 3 Output	C2	4	C3	C3	4 (X1a)
Ch 4 Output	B2	17	C4	C4	17 (X1a)
Ch 3/Ch 4, L1-	A2	-	A3, A4	A3, A3	-
Ch 5/Ch 6, L1+	-	-	-	-	-
Ch 5 Output	C3	5	C5	C5	5 (X1a)
Ch 6 Output	B3	18	C6	C6	18 (X1a)
Ch 5/Ch 6, L1-	A3	-	A5, A6	A5, A6	-
Ch 7/Ch 8, L1+	-	-	-	-	-
Ch 7 Output	C4	6	C7	C7	6 (X1a)
Ch 8 Output	B4	19	C8	C8	19 (X1a)
Ch 7/Ch 8, L1-	A4	-	A7, A8	A7, A8	-
Ch 9/Ch 10, L2+	-	-	-	-	-

Table 94. DO840 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal	TU842 TU843 Terminal	TU852 Terminal
Ch 9 Output	C5	7	C9	C9	7 (X1a)
Ch 10 Output	B5	20	C10	C10	20 (X1a)
Ch 9/Ch 10, L2-	A5	-	A9, A10	A9, A10	-
Ch 11/Ch 12, L2+	-	-	-	-	-
Ch 11 Output	C6	8	C11	C11	8 (X1a)
Ch 12 Output	B6	21	C12	C12	21 (X1a)
Ch 11/Ch 12, L2-	A6	-	A11, A12	A11, A12	-
Ch 13/Ch 14, L2+	-	-	-	-	-
Ch 13 Output	C7	9	C13	C13	9 (X1a)
Ch 14 Output	B7	22	C14	C14	22 (X1a)
Ch 13/Ch 14, L2-	A7	-	A13, A14	A13, A14	-
Ch 15/ Ch16, L2+	-	-	-	-	-
Ch 15 Output	C8	10	C15	C15	10 (X1a)
Ch 16 Output	B8	23	C16	C16	23 (X1a)
Ch 15/Ch16, L2-	A8	-	A15, A16	A15, A16	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+	11, 24 (X1a and X1b)
0 V d.c.	L2-	12, 25	L2- (2)	L2-	12, 25 (X1a and X1b)

(1) Pin 13 connected to connector body for EM.

Figure 205 shows the process connections for the Digital Output Module DO840 when installed on a TU830/TU833 Extended MTU.

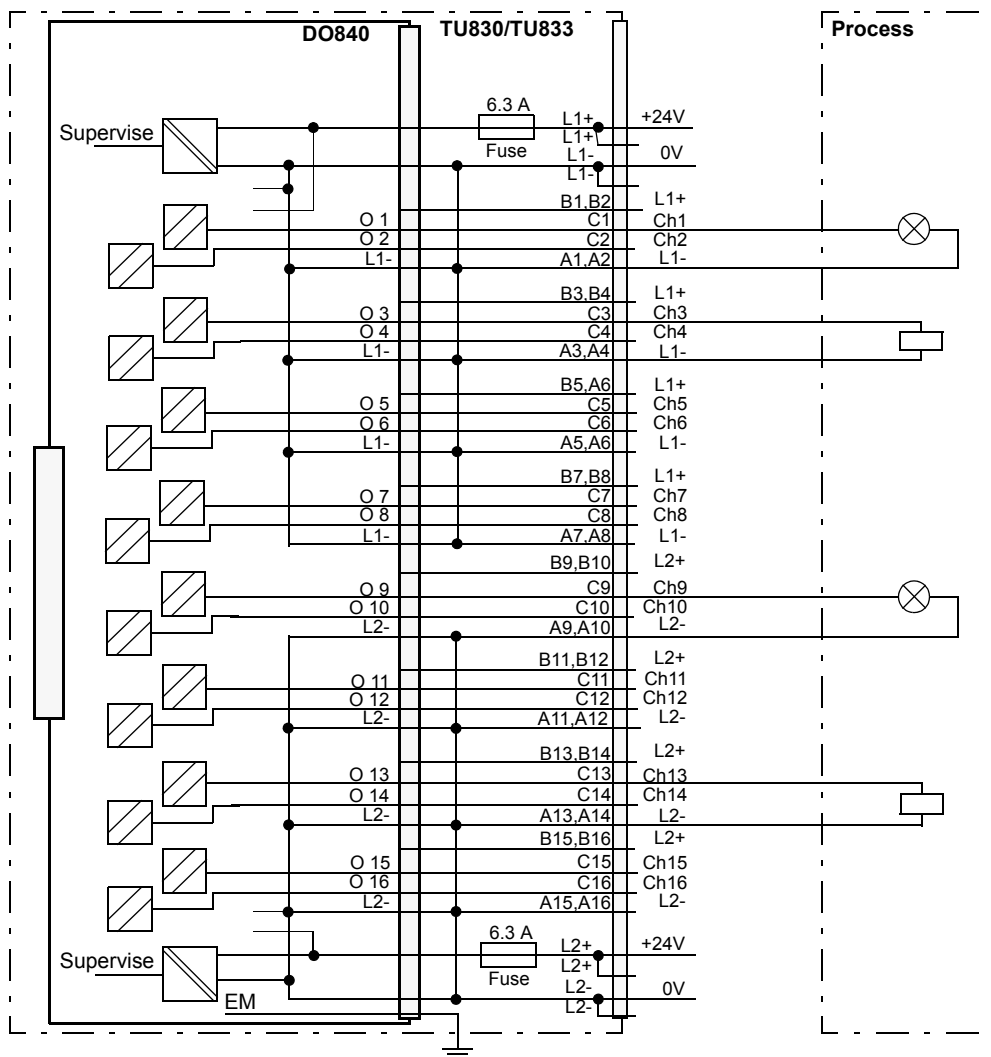


Figure 205. DO840 with TU830/TU833 Extended MTU Process Connections

Figure 206 shows the process connections for the Digital Output Module DO840 when installed on a TU810 or TU814 Compact MTU.

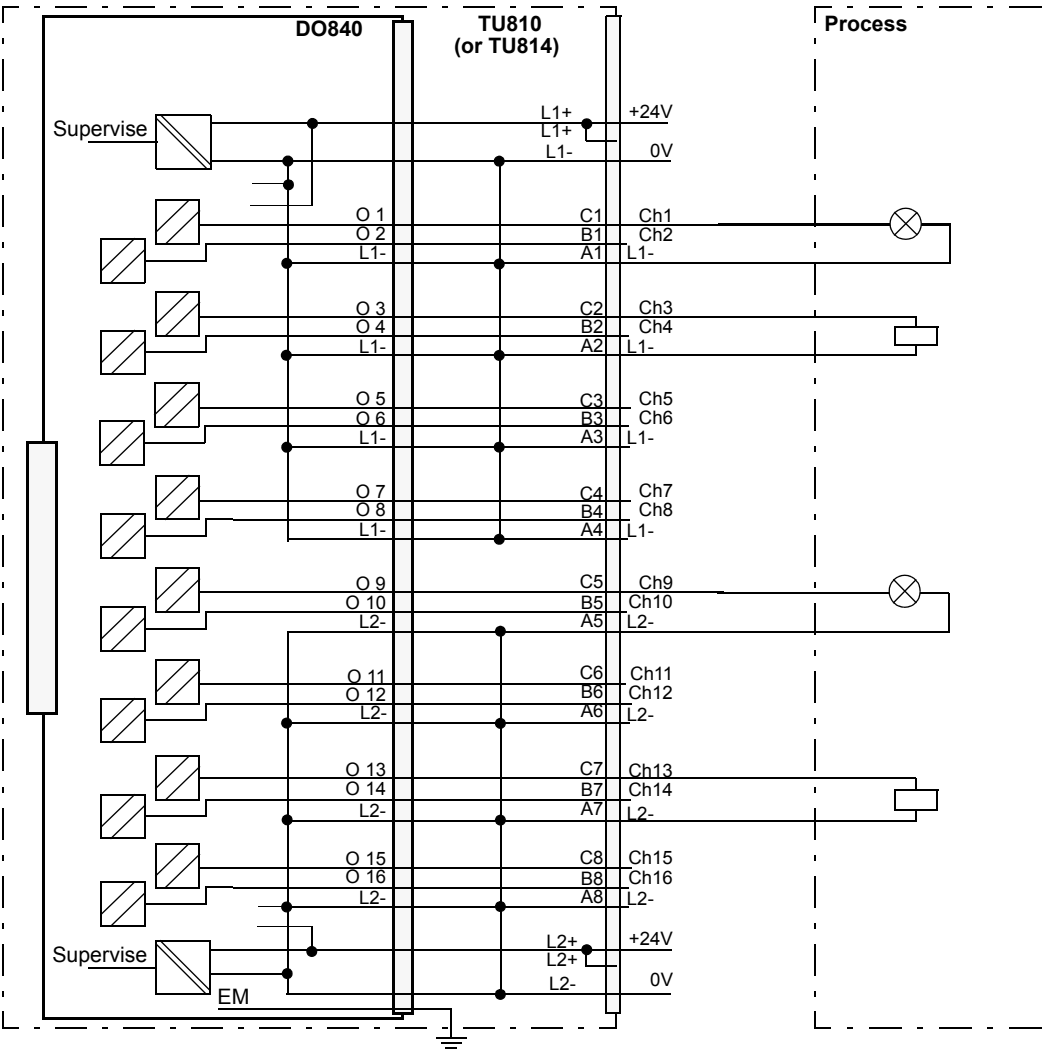


Figure 206. DO840 with TU810 or TU814 Compact MTU Process Connections

Figure 207 shows the process connections for the Digital Output Module DO840 when installed on a TU812 Compact MTU.

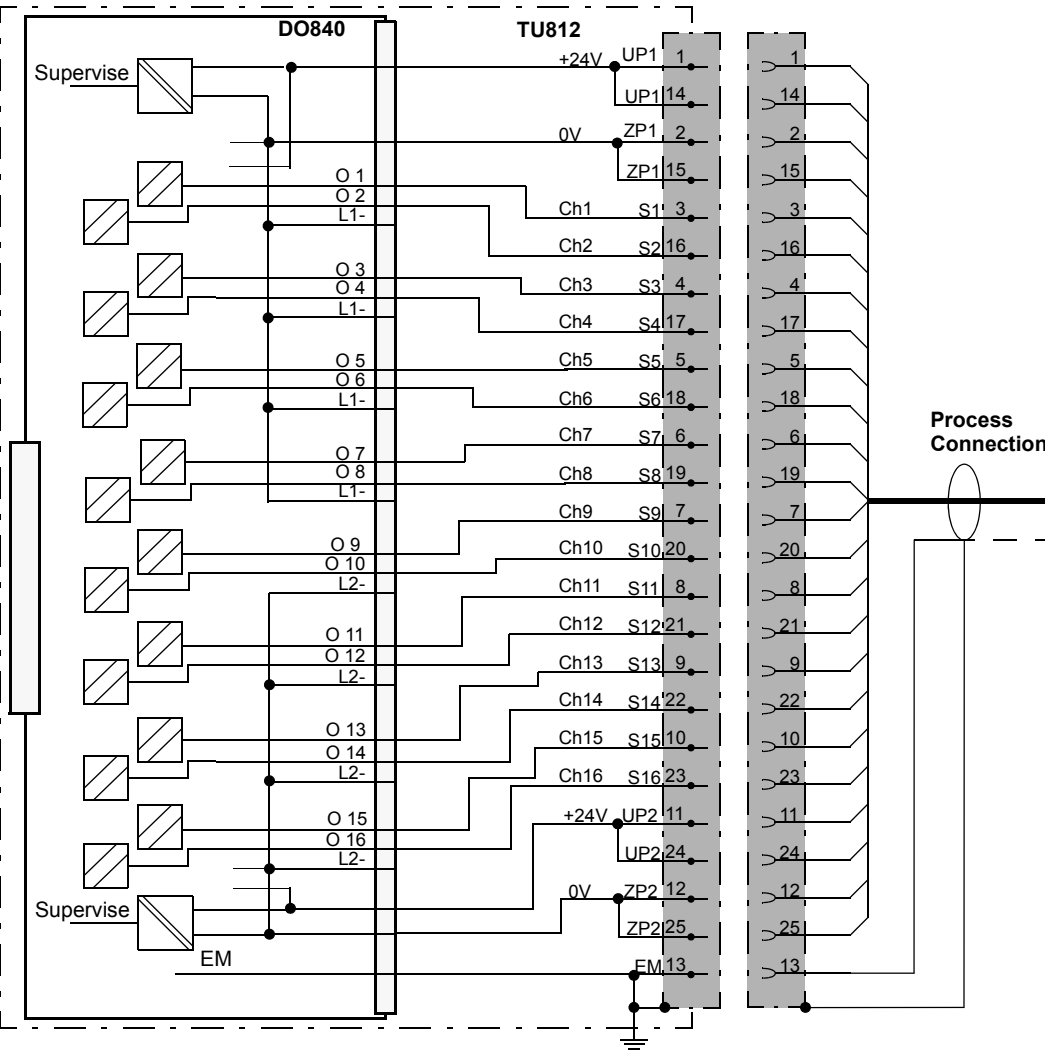


Figure 207. DO840 with TU812 Compact MTU Process Connections

Figure 208 shows the process connections for the Digital Output Module DO840 when installed on a TU842 or TU843 Redundant MTU.

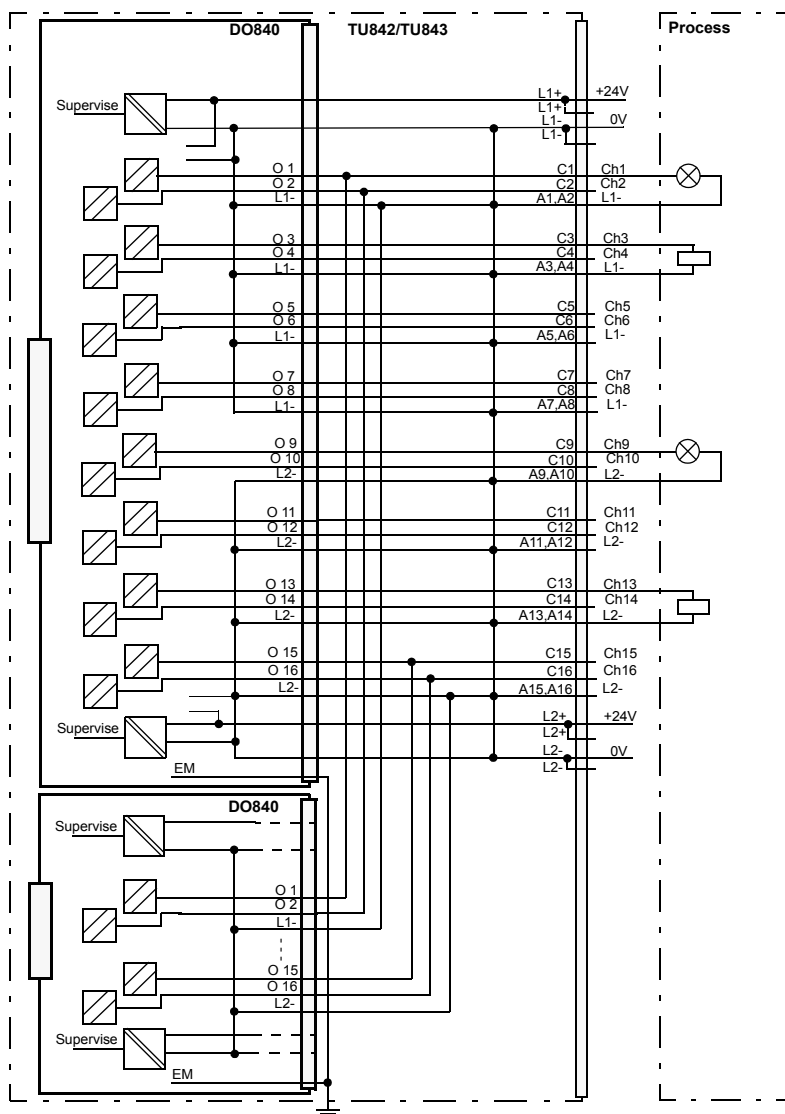


Figure 208. DO840 with TU842 or TU843 Redundant MTU Process Connections



Figure 209 shows the process connections for the Digital Output Module DO840 when installed on a TU852 MTU.

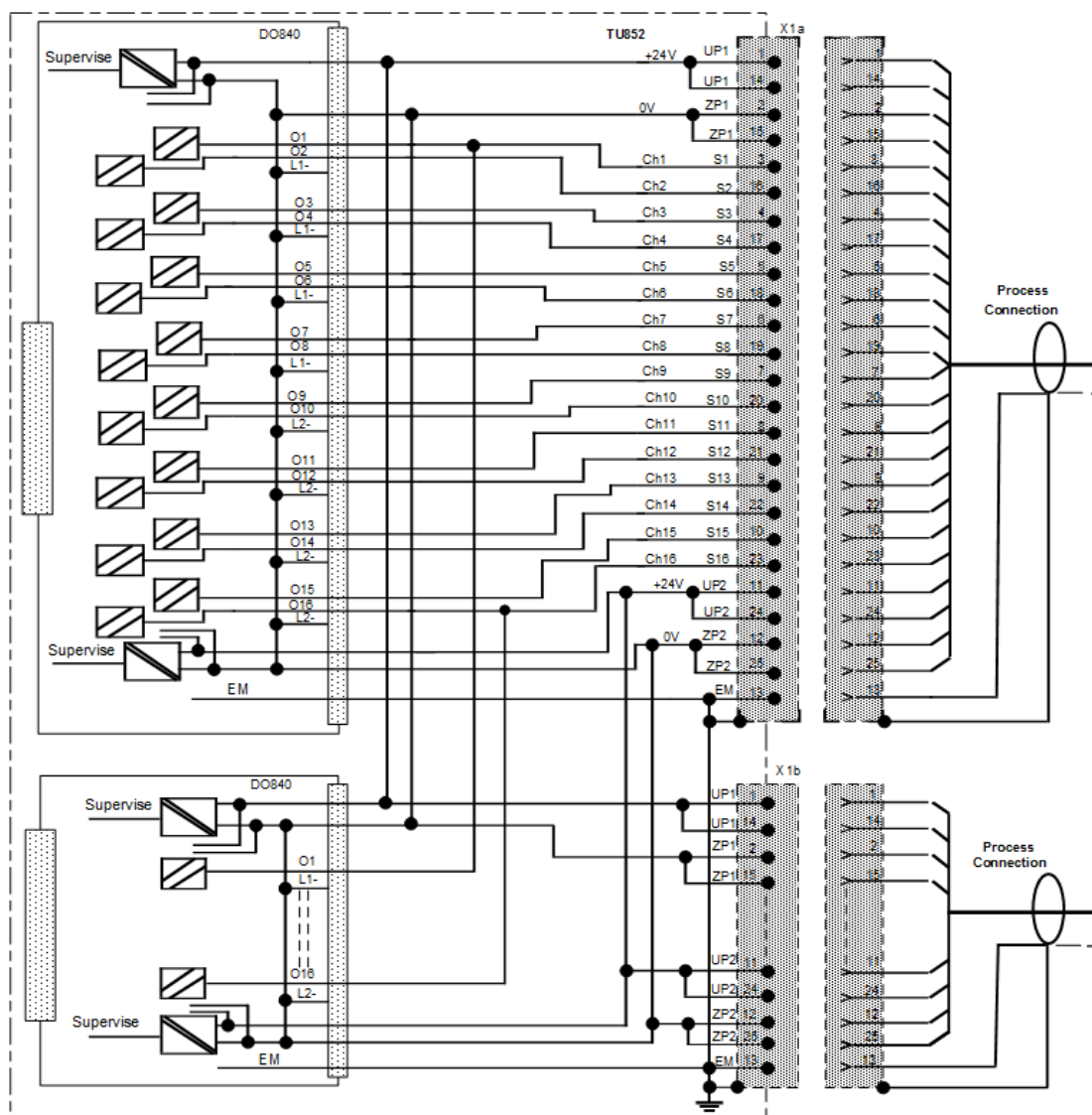
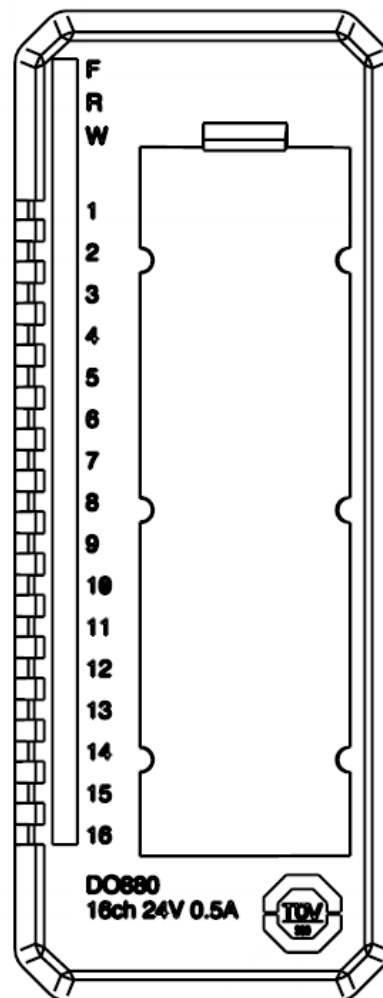


Figure 209. DO840 with TU852 Compact MTU Process Connections

## DO880 High Integrity Digital Output Module

### Features

- 16 channels for 24 V d.c. current sourcing outputs in one isolated group.
- Redundant or single configuration.
- Loop monitoring, supervision of short and open load with configurable limits (see table [Table 95](#)).
- Diagnostic of output switches without pulsing on outputs.
- Advanced on-board diagnostics.
- Output status indicators (activated/error).
- Degraded mode for normally energized channels (supported from DO880 PR:G).
- Current limitation at short circuit and over-temperature protection of switches.
- Fault tolerance of 1 (as defined in IEC 61508) for output drivers. For ND (Normally De-energized) systems, outputs can still be controlled with error on output drivers.
- Certified for SIL3 according to IEC 61508.
- Certified for Category 4 according to EN 954-1.



### Description

The DO880 is a 16 channel 24 V digital output module for single or redundant application. The maximum continuous output current per channel is 0.5 A. The outputs are current limited and protected against over temperature.

Each output channel consists of a current limited and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and an isolation barrier to the Modulebus.

In addition to the four module LEDs, DO880 has one LED (Yellow/Red) per channel (16) that indicates the output state and channel error (Yellow = output is energized, Off = output is de-energized, Red = channel error).

The outputs can be set in two different modes for handling of over load, automatic reset when overload/short is removed or manual reset by operator (forcing output off and on).

The outputs are current protected and protected against over temperature. If load increases above 0,6A, the output will be switched off and an external channel error reported.

Five different types of MTUs can be used for single configuration. TU830/TU833 Extended MTU and TU810 (or TU814). The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant configuration there are three types of MTUs, TU842/TU852 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

Shielded field cables are required for process connections (over all shield is sufficient if a multi core cable contains sorted signal types).

### **Self-diagnostic Functions**

The module cyclically performs comprehensive self-diagnostic. Detected failures are grouped and reported as described below:

- Errors in External power supply and detected field loop fault will be reported as External error.
- Errors in circuits only affecting specific channels on the module (short circuits, open circuits, stuck-at faults) will be reported as Internal channel error.
- Errors in internal power supplies, Errors in micro controller, FPGA and Memory will be reported as Module Error.

**Technical Data***Table 95. DO880 High Integrity Digital Output Module Specifications*

<b>Feature</b>	<b>DO880 Digital Output Module</b>
Number of channels	16
Type of output	Transistor current sourcing, current limited
Voltage range	19.2 - 32 V
Load current, maximum	0.5 A
Maximum continuous load current total per module	8A @ $\leq 55^{\circ}\text{C}$
Short circuit current, maximum	See <a href="#">Figure 210</a>
Leakage current, maximum	$<100\ \mu\text{A}$
Loop monitoring	Open circuit and short circuit detection in both de-energized and energized state. Configurable for loop resistance from $50\ \Omega$ to $2\ \text{k}\Omega$ depending on configuration and mode of operation (when using inductive loads, the time constant (L/R) should be less than 3ms).
De-energized safe voltage at fault	$<5\ \text{V}$
De-energized safe current at fault	$<35\ \text{mA}$
On-state voltage drop	$<0.8\ \text{V}$
Maximum field cable length	600 meters (656 yd.)
Current consumption 5 V (Modulebus)	45 mA
Current consumption 24 V (Modulebus)	55 mA (max)
Current consumption 24 V (process power supply, UPx), no external load	10 mA

*Table 95. DO880 High Integrity Digital Output Module Specifications  
(Continued)*

<b>Feature</b>	<b>DO880 Digital Output Module</b>
Power dissipation	5.6 W (0,5 A x 16 channels)
Maximum switching frequency	1.25 Hz
Process voltage supervision	Yes
Isolation	Yes
Mounting termination units	TU810, TU812, TU814, TU830, TU833, TU842, TU843 and TU852
MTU keying code	FE
Propagation delay Modulebus output	15 ms max
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

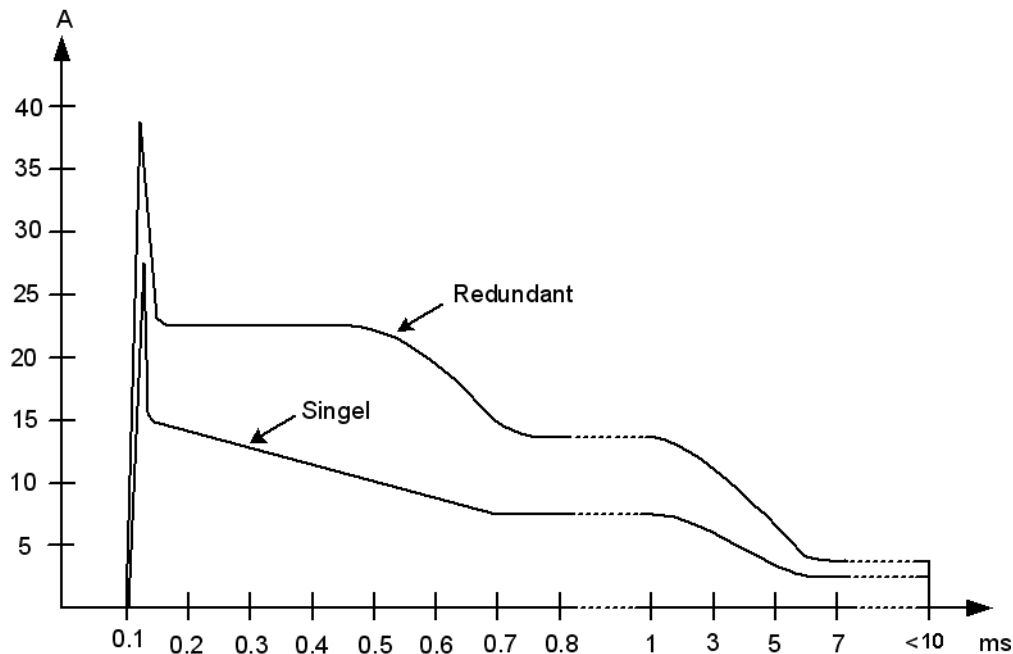
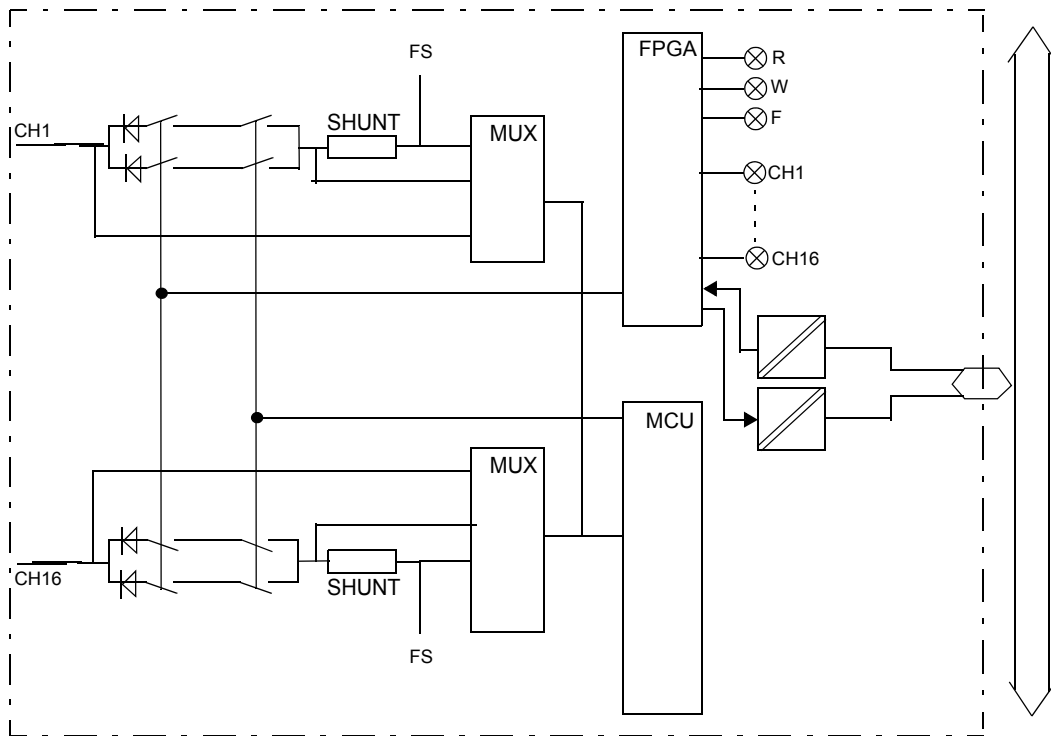


Figure 210. Short circuit current, worst case

The short circuit current is dependent on the power supply and the cable resistance. A configuration with a power supply with very low internal resistance and a very low cable resistance represents the worst case.

**Block Diagram DO880***Figure 211. Block Diagram D0880*

### Process Connections

Shielded cables<sup>C</sup> should be used for process connections (over all shield is sufficient if a multi core cable contains sorted signal types).

Table 96. DO880 Process Connections

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal	TU842 TU843 Terminal	TU852 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	1, 14 (X1a and X1b)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	2, 15 (X1a and X1b)
Ch 1 Output	C1	3	C1	C1	3 (X1a)
Ch 2 Output	B1	16	C2	C2	16 (X1a)
Ch 1/Ch 2, L1-	A1	-	A1, A2	A1, A2	-
Ch 3 Output	C2	4	C3	C3	4 (X1a)
Ch 4 Output	B2	17	C4	C4	17 (X1a)
Ch 3/Ch 4, L1-	A2	-	A3, A4	A3, A3	-
Ch 5 Output	C3	5	C5	C5	5 (X1a)
Ch 6 Output	B3	18	C6	C6	18 (X1a)
Ch 5/Ch 6, L1-	A3	-	A5, A6	A5, A6	-
Ch 7 Output	C4	6	C7	C7	6 (X1a)
Ch 8 Output	B4	19	C8	C8	19 (X1a)
Ch 7/Ch 8, L1-	A4	-	A7, A8	A7, A8	-
Ch 9 Output	C5	7	C9	C9	7 (X1a)
Ch 10 Output	B5	20	C10	C10	20 (X1a)

C. For use without shielded cables, see *Technical Description 3BSE070238*



Table 96. DO880 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector <sup>(1)</sup>	TU830/TU833 Terminal	TU842 TU843 Terminal	TU852 Terminal
Ch 9/Ch 10, L2-	A5	-	A9, A10	A9, A10	-
Ch 11 Output	C6	8	C11	C11	8 (X1a)
Ch 12 Output	B6	21	C12	C12	21 (X1a)
Ch 11/Ch 12, L2-	A6	-	A11, A12	A11, A12	-
Ch 13 Output	C7	9	C13	C13	9 (X1a)
Ch 14 Output	B7	22	C14	C14	22 (X1a)
Ch 13/Ch 14, L2-	A7	-	A13, A14	A13, A14	-
Ch 15 Output	C8	10	C15	C15	10 (X1a)
Ch 16 Output	B8	23	C16	C16	23 (X1a)
Ch 15/Ch16, L2-	A8	-	A15, A16	A15, A16	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	11, 24 (X1a and X1b)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	12, 25 (X1a and X1b)

(1) Pin 13 connected to connector body for EM.

Figure 212 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU830/TU833 Extended MTU.

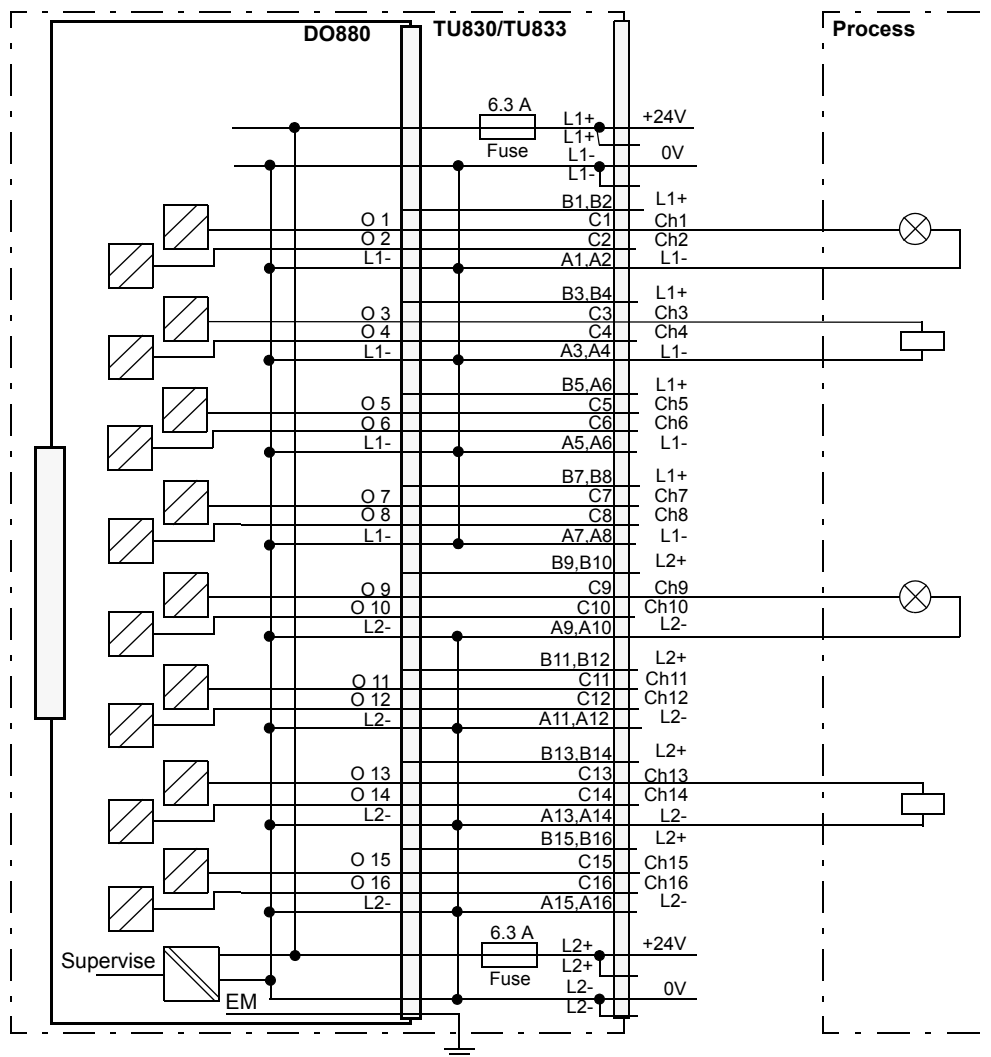


Figure 212. DO880 with TU830/TU833 Extended MTU Process Connections

Figure 213 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU810 or TU814 Compact MTU.

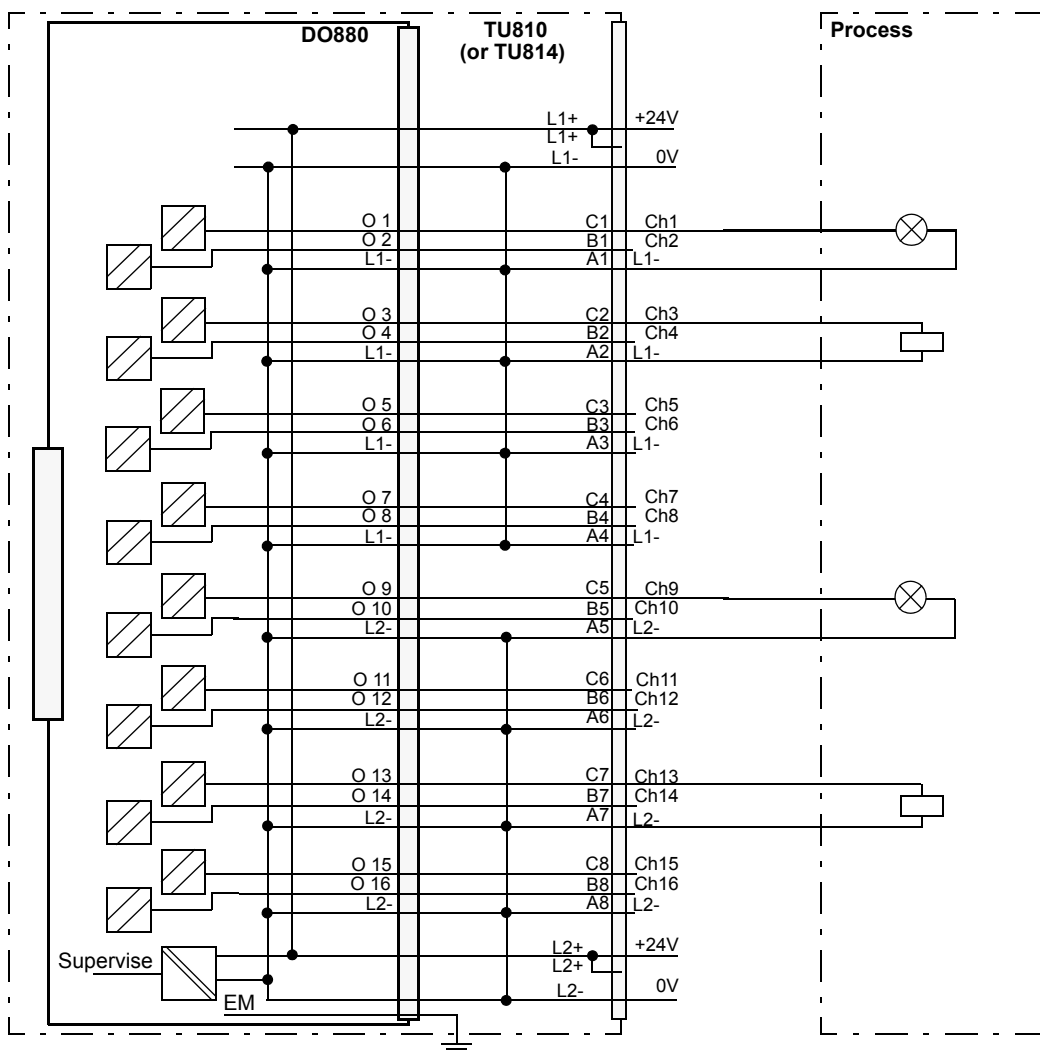


Figure 213. DO880 with TU810 or TU814 Compact MTU Process Connections

Figure 214 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU812 Compact MTU.

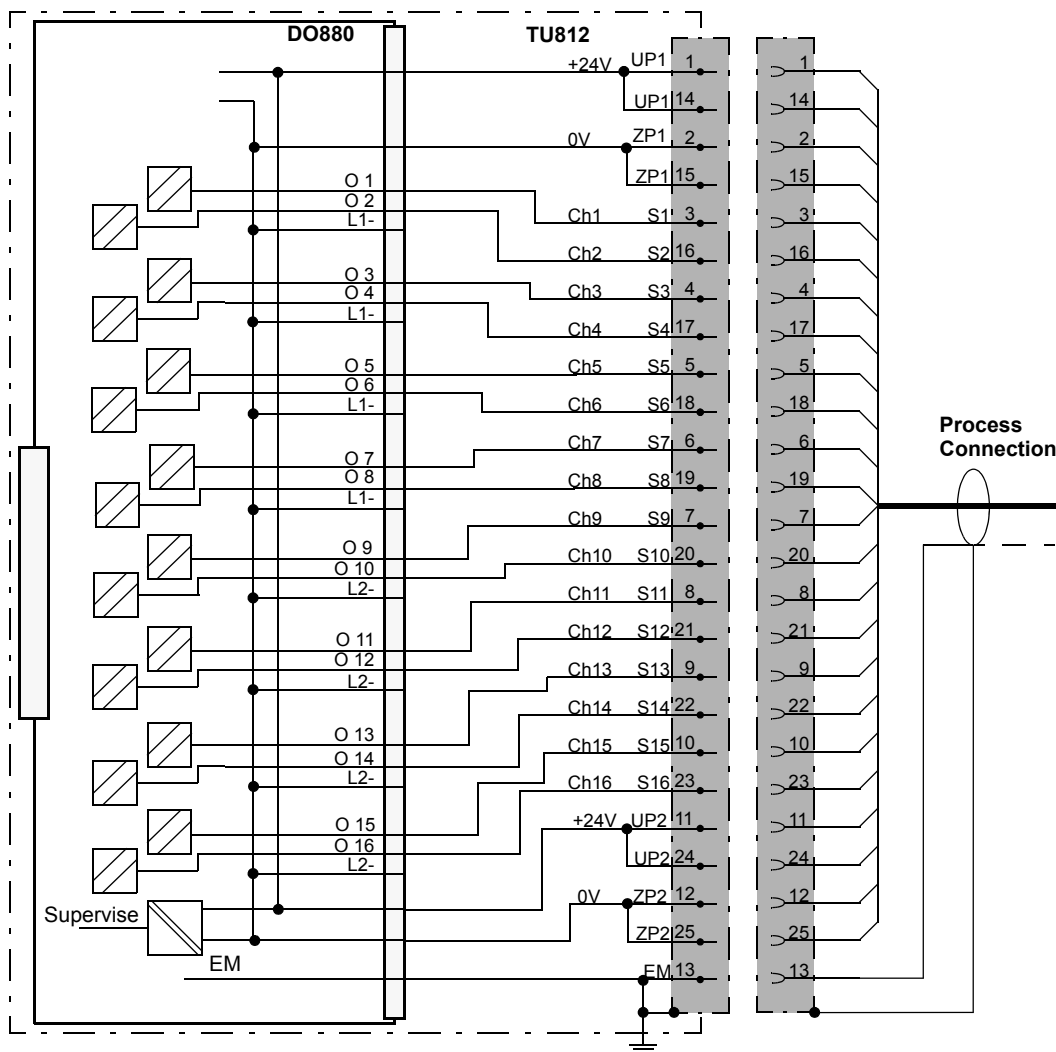


Figure 214. DO880 with TU812 Compact MTU Process Connections

Figure 215 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU842 or TU843 Redundant MTU.

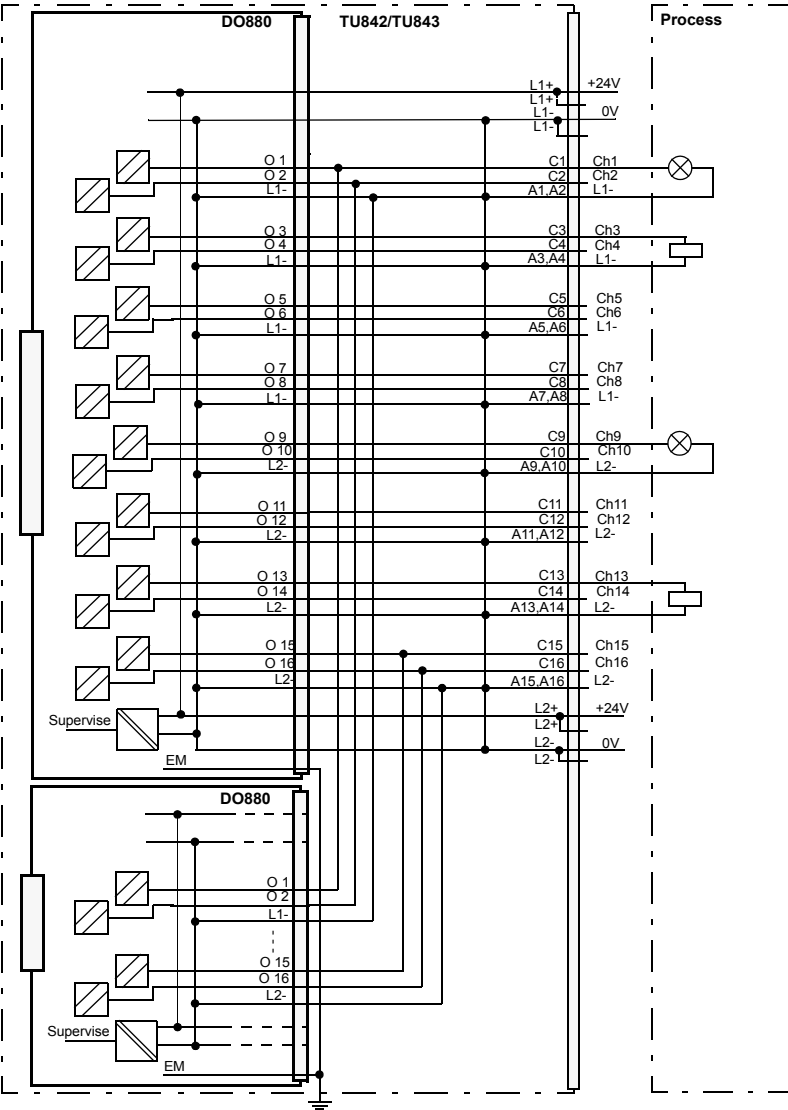


Figure 215. DO880 with TU842 or TU843 Redundant MTU Process Connections

Figure 216 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU852 MTU.

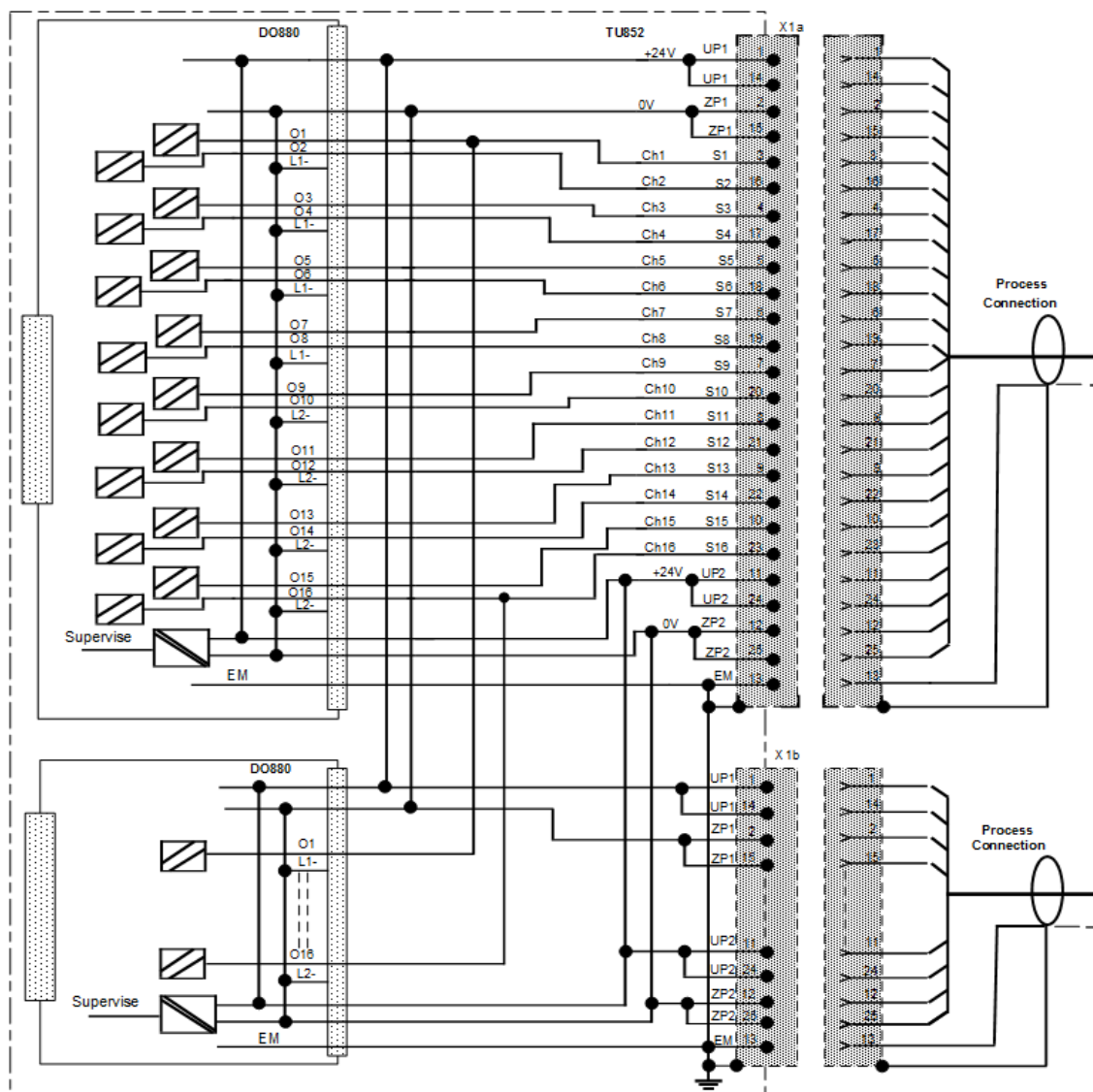


Figure 216. DO880 with TU852 Compact MTU Process Connections

## DP820 Incremental Pulse Counter Module

### Features

- Two channels.
- Interface for RS422, 5 V, 12 V, 24 V and 13 mA transducer signal levels.
- Simultaneous pulse count and frequency measurement.
- Pulse count (length/position) by accumulation in a bidirectional 29 bit counter.
- Frequency (speed) measurement 0.25 Hz - 1.5 MHz.

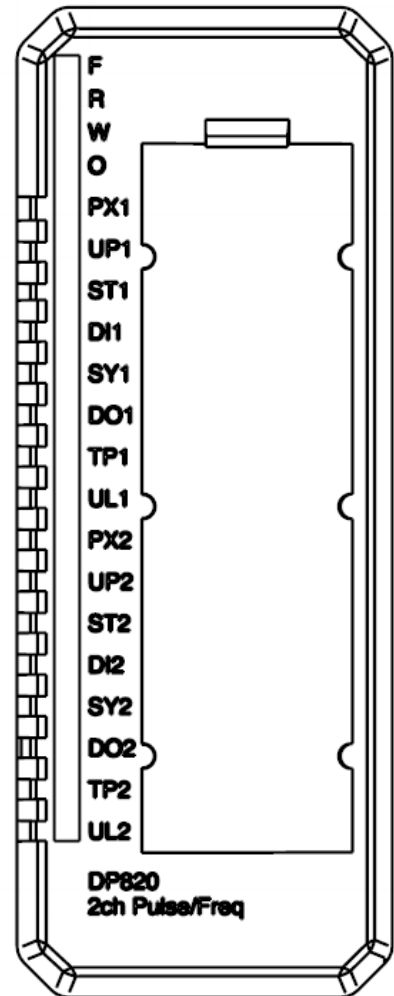
### Description

The DP820 module consists of two identical independent channels. Each channel can be used for independent pulse count (length/position) and frequency (speed) measurement.

### Transducer Connection

Each channel has four inputs (A, B, ST and DI) and one output (DO). The input signals A and B are used as pulse inputs. The input signals ST and DI is used for synchronizing, sampling and gated count purposes.

The balanced inputs A, B and ST can be connected to pulse transducers with RS422, 5 V, 12 V, 24 V and 13 mA signal levels if an extended MTU is used (TU830). Adaption to different signal levels is made by using different terminals on the MTU (see section about process connection).



Pulse transducers with RS422, 5 V, 12V, 24V and 13 mA signal levels can be used if an compact MTU is used (TU810, TU812 or TU814).



An external resistor is needed for 12V and 24V range when using the compact MTU (see the process connection diagrams for DP820).

The unipolar input (DI) is intended for 24 V unipolar signal level.

The DO output is a current limited digital output, current sourcing type, 24 V d.c., 0.5 A.

All signals are individually isolated.

All inputs have overvoltage protection. A maximum voltage of 30 V can be connected without any damages.

Shielded twisted pair cables with characteristic impedance=100 (+/- 25%) ohm shall be used for connection of transducers with RS422/5 V /13 mA signals.

### **Input Filter**

Each DP820 input has a configurable input filter (see Technical Data). Notice the following restrictions for selection of filters for inputs A or B:

- The 1 $\mu$ s filter shall always be used when 12 V and 24 V inputs are used.
- Unfiltered inputs can be used if RS422/+5 V /13 mA inputs are used, but cables between transducers and the DP820 module must then be separated from other cables to avoid that extra pulses that occur due to EMI.

### **Pulse Encoding**

The following different methods for pulse encoding are supported by DP820:

- Input A is used for counting up, input B is used for counting down, u/d.
- Input A is used for pulse counting, input B is used to determine count direction, c/d, B=0: down, B=1: up.
- Input A and B is used for a quadrature encoded signals. Multiplication factors x 1, x 2 and x 4 can be specified. Count direction is determined by A and B phase shift:



. 00 → 10 → 11 → 01 → 00 → 10 → ...  
. 11 → 10 → 00 → 01 → 11 → 10 → ...

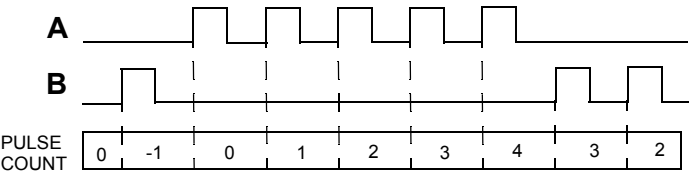


Figure 217. Up/Down Pulse Mode

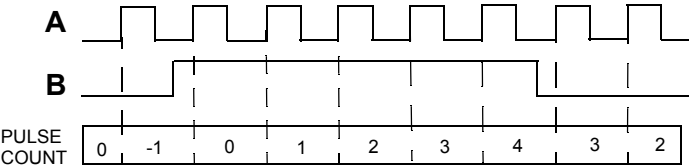


Figure 218. Count/Direction Mode

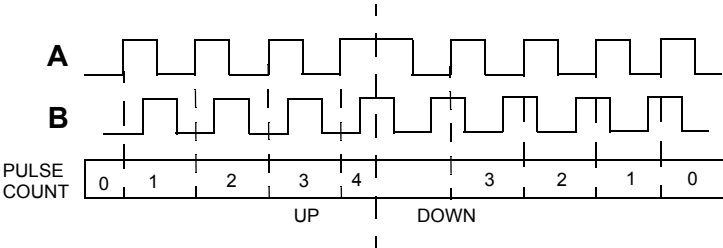


Figure 219. Quadrature Mode, #1 (Count on Pos. Edge Input A)

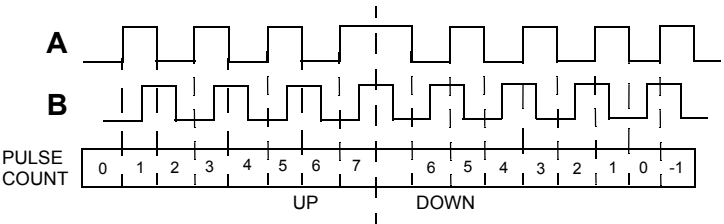


Figure 220. Quadrature Mode, #2 (Count on Pos. Edge and Neg. Edge Input A)

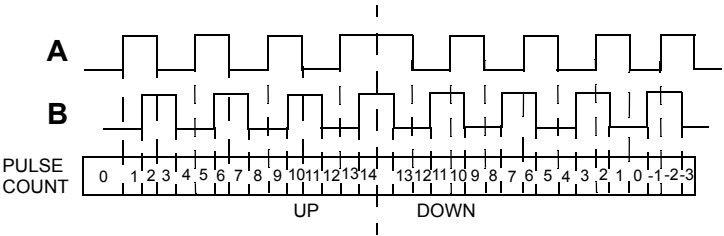


Figure 221. Quadrature Mode, #4 (Count on Pos. Edge and Neg. Edge Input A and Input B)

**Pulse Count (Length/Position) Measurement**

Pulse count is done by pulse accumulation in a 29-bit (28bit + sign) bidirectional pulse counter. The pulse counter value is normally continuously loaded into the pulse register (see block diagram).

A pulse count sample condition can be specified by the user. When a sample condition is fulfilled is the value in the pulse register “frozen”. The value in the pulse register will remain “frozen” until a freeze disable command is received from the controller. The pulse accumulation in the pulse counter continues during the time when the pulse register is frozen.

The value of the pulse register (that is, actual pulse count value or “freezed” value) is read by the CPU, and transferred to the controller.

The pulse counter is synchronized (that is, set to zero) if a user selectable synchronization condition is fulfilled.

A comparator is used to compare the value of the pulse counter with the content of the compare register. The value of the compare register is specified by the user. A “coincidence” occur when a equal condition is detected by the comparator.

The coincidence function can be used to control the digital output signal (DO), as pulse count sample condition, as synchronization condition and as frequency sample condition (see below).

The pulse counter has overflow detection.

### Gated Count Mode

In gated count mode the pulse counter only counts when the gate is active. The gate is controlled by the DI input. The gate can be controlled in two different ways:

The DI input is level sensitive, that is, the counter only counts when DI = high.

The DI input is edge sensitive, that is, the counter starts count on a positive edge on the DI input, stops on the next positive edge, continues on the next positive edge, and so forth.

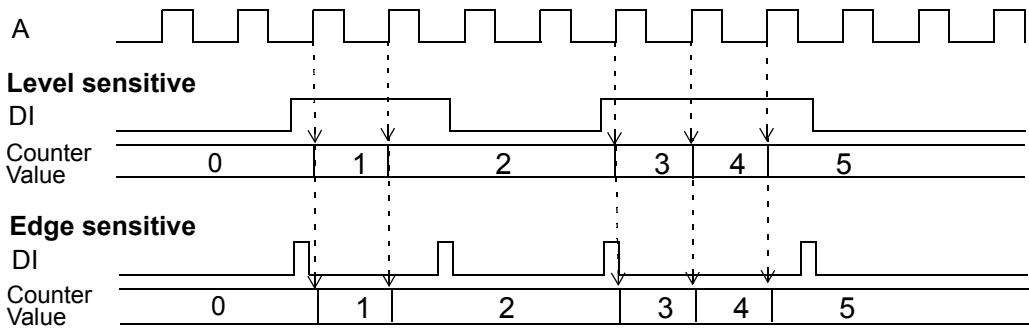


Figure 222. Gated Count Mode in Two different Ways

Synchronization and sample conditions which uses the DI signal as part of the condition can not be used in gated count mode.

**Frequency (speed) Measurement.**

The frequency measurement function consists of two counters, that is, the SX and SR counters (see block diagram). The SX counter is used to count number of pulses ( $S_x$ ) from the unknown input frequency. The SR counter is used to count the number of pulses ( $S_r$ ) from a reference frequency source with frequency  $F_{REF}$ . The frequency value ( $F_x$ ) is calculated as:

$$F_x = F_{REF} \times S_x / S_r$$

The SX counter is implemented by a 24 bit up/down counter (23 bit + sign). The SR counter is implemented by a 24 bit up-counter.

The SX and SR counters accumulates pulses during a measurement period. The measurement period can be determined in two different ways (user selectable):

By a measurement interval timer.

By the coincidence comparator function.

With the first method is a measurement interval for each channel defined by the user in increments of 1 ms from 1 to 2.700 ms. By changing the measurement interval the user can select a suitable filter time (integration time) with respect to the application's requirements.

With the second method is the measure interval controlled by the coincidence function, that is, a measurement interval is started when a coincidence is detected. Next coincidence terminates the measurement interval, and starts a new measurement interval.

At the end of each measurement period are the SX and SR registers is updated with the value of the SX and SR counters. The CPU reads the content in the SX and SR registers and calculates a frequency value.

It is possible to synchronize frequency measurements between the two channels, that is, the measurement period from one of the channels is then used by both channels.

A frequency sample condition can be specified by the user. When a sample condition is fulfilled is the value in the SX and SR registers "frozen". The value in

the SX and SR registers will remain “frozen” until a freeze disable command is received from the controller. The pulse accumulation in the SX and SR counters continues during the time when the SX and SR registers is frozen

The reference counter (SR) has a overflow detection function. The SR overflow will be activated if no incoming pulses has been detected during 4.3 s. When the CPU detects SR overflow, is the frequency value set to zero.

### Digital Output

The digital output function can be configured in four different ways:

1. The digital output DO is activated when coincidence occur, and inactivated after a configurable pulse-length (1ms - 65535 ms).
2. The digital output DO is activated when DOVALUE=1, and inactivated after a configurable pulse-length (1ms - 65535 ms). The function is retriggable.
3. The digital output DO is activated when DOVALUE=1, and deactivated DOVALUE=0.
4. The digital output DO is activated when coincidence occur **and** the DOVALUE=1, and inactivated when DOVALUE=0.

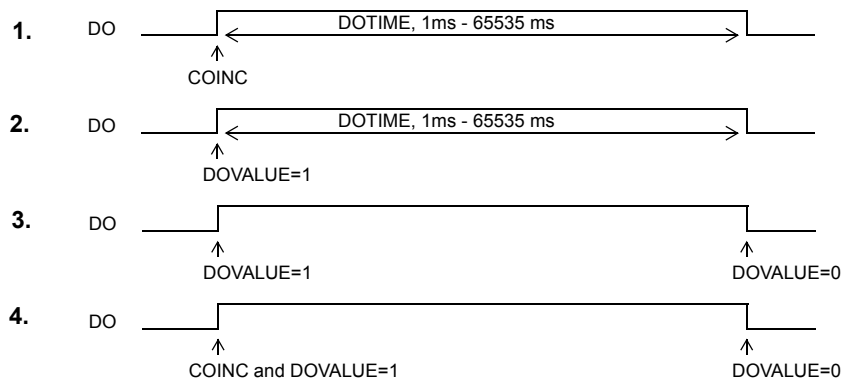


Figure 223. Configuration of Digital Output Function

### OSP Function

The digital outputs will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is re-triggered every time the correct module address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state.

The function in OSP state, and when reentering the operational state, will be different depending on how the DO function is configured (see Digital Output 1 - 4 above):

1. Function in OSP state: No more pulses will be activated as long as the module remains in OSP state. The DO pulse is always completed if the OSP-state is entered during an active DO pulse (this is, the pulse width is always in accordance with the DOTIME value).  
Function when reentering operational state: The coincidence function has to be enabled before normal DO function will start.
2. Function in OSP state: Same as in 1. above. Function when reentering operational state: A new DO-pulse will be started as soon as a modulebus frame with DOVALUE=1 is received.
3. Function in OSP state: The digital outputs are set to their OSP values which can be configured as a predefined value or to use last good value sent.  
Function when reentering operational state: The outputs keeps the OSP value until a modulebus frame with a new DOVALUE value is received.
4. Same as 3.

### LED Indicators

For description about the LED-indicators with comments see [Table 97](#).

*Table 97. Description of LED-Indicators*

Name	Name	Color	Comments
PX1	PX2	Yellow	Activated on each pulse on A or B input (>0.5s flash)
UP1	UP2	Yellow	Activated when count direction = up

Table 97. Description of LED-Indicators (Continued)

Name	Name	Color	Comments
ST1	ST2	Yellow	Activated on each pulse on ST input (>0.5s flash)
DI1	DI2	Yellow	Activated on each pulse on DI input (>0.5s flash)
SY1	SY2	Yellow	Activated on PSX counter sync. (>0.5s flash)
DO1	DO2	Yellow	Activated when DO is activated (>0.5s flash)
TP1	TP2	Green	Transducer power OK

**Technical Data**

Table 98. DP820 Incremental Pulse Counter Module Specifications

Feature	DP820 Digital Pulse Counter
Number of channels	2
Power Supply voltage	24 V d.c. (12 to 32 V d.c.)
Max non-destructive voltage on inputs A, B, ST or DI	30 V d.c.
Maximum field cable length	200 m
Cable type Characteristic impedance	Shielded, twisted pair 100 (+/- 25%) ohm
Configurable input filters Input A and B Input ST Input DI	Unfiltered or 1 $\mu$ s 1 $\mu$ s or 220 $\mu$ s 220 $\mu$ s or 2.2 ms

Table 98. DP820 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP820 Digital Pulse Counter
Max input frequency / Min pulse width, input A and B for the RS422/+5V/13mA range Filter = unfiltered Pulse encoding = u/d or c/d Pulse encoding = quadrature Filter = 1 $\mu$ s Pulse encoding = u/d or c/d Pulse encoding = quadrature	1.5 MHz / 333 ns 750 kHz / 667 ns  200 kHz / 2.5 $\mu$ s 100 kHz / 5 $\mu$ s
Max input frequency / Min pulse width, input A and B for the 12V range (only TU830) Filter = unfiltered Filter = 1 $\mu$ s Pulse encoding = u/d or c/d Pulse encoding = quadrature	Not allowed  200 kHz / 2.5 $\mu$ s 100 kHz / 5 $\mu$ s
Max input frequency / Min pulse width, input A and B for the 24V range (only TU830) Filter = unfiltered Filter = 1 $\mu$ s Pulse encoding = u/d or c/d Pulse encoding = quadrature	Not allowed 200 kHz / 2.5 $\mu$ s 100 kHz / 5 $\mu$ s
Max. input frequency/Min. pulse width, input ST All voltage ranges Filter = 1 $\mu$ s Filter = 220 $\mu$ s	200 kHz / 2.5 $\mu$ s 1 kHz / 500 $\mu$ s
Max. input frequency/Min. pulse width, input DI Filter = 220 $\mu$ s Filter = 2.2 ms	1 kHz / 500 $\mu$ s 0.1 kHz / 5ms



Table 98. DP820 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP820 Digital Pulse Counter
Input impedance, A, B and ST -inputs RS422/+5 V /13 mA - range 12 V - range (only TU830) 24 V - range (only TU830)	100 $\Omega$ <sup>(1)</sup> characteristic impedance 1 k $\Omega$ 2 k $\Omega$
Input impedance, DI - input	2.5 k $\Omega$
Input signal voltage range Input A, B, ST RS422/+5 V /13 mA - range "1" "0" 12 V - range (external resistance) <sup>(2)</sup> "1" "0" 24 V - range (only TU830) <sup>(3)</sup> "1" "0" Input DI "1" "0"	2.5 V to 30 V -30 V to 1.0 V 8 V to 30 V -30 V to 2.0 V 15 V to 30 V -30 V to 5.0 V 15 V to 30 V -30 V to 5.0 V
Digital output, max. load current	0.5 A
Digital output, max. short circuit current	2.4 A
Digital output, max. leakage current	10 $\mu$ A
Digital output, max. output impedance	0.4 $\Omega$

Table 98. DP820 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP820 Digital Pulse Counter
Max. frequency measurement error Relative error Absolute error (Temperature drift included)	[260/(MEASTIME <sub>x</sub> in ms)] ppm [(260/(MEASTIME <sub>x</sub> in ms)) +100] ppm
Resolution at frequency measurement in percentage of actual frequency Resolution in% = $25.6 \times 10^{-3}$ / Measuring time in ms	Measuring time 1 ms, Resolution = 0,026 Measuring time 2700 ms, Resolution = $9,5 \times 10^{-6}$
Current consumption, 5 V (Modulebus)	120 mA
Power dissipation	2.5 W
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group)
Isolation	Individually isolated channels
Mounting termination units	TU810, TU812, TU814, TU830 or TU833
MTU keying code	CB
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

- (1) Load 20 mA at 5 V, 8 mA at 2.5 V  
 (2) With TU830 external resistor 1.8 k $\Omega$ , see [Figure 228](#).  
 With TU810, TU814 external resistor ca 920  $\Omega$ , see [Figure 225](#).  
 (3) With external resistor also TU810, TU814  
 External resistor 1.8 k $\Omega$ , see [Figure 225](#).

Block Diagram DP820

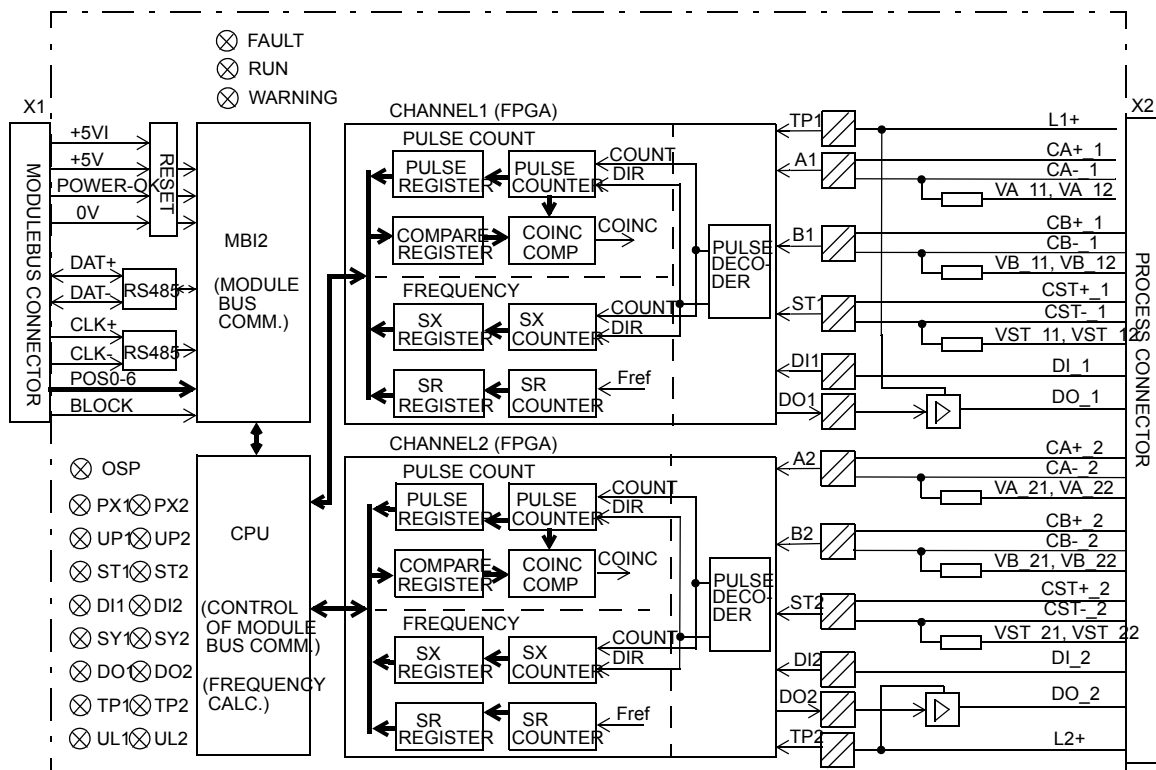


Figure 224. DP820 Block Diagram

**Process Connections***Table 99. DP820 Process Connections*

<b>Process Connection</b>	<b>TU810 (or TU814) Terminal</b>	<b>TU812 D-Sub 25 Male Connector <sup>(1)</sup></b>	<b>TU830/TU833 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)
Ch1, CA+	C1	3	C1
Ch1, CA-	B1	16	C2
Ch1, VA_1	-	-	B1
Ch1, VA_2	-	-	B2
Ch1, Zp	A1	-	A1, A2
Ch1, CB+	C2	4	C3
Ch1, CB-	B2	17	C4
Ch1, VB_1	-	-	B3
Ch1, VB_2	-	-	B4
Ch1, Zp	A2	-	A3, A4
Ch1, CST+	C3	5	C5
Ch1, CST-	B3	18	C6
Ch1, VST_1	-	-	B5
Ch1, VST_2	-	-	B6
Ch1, Zp	A3	-	A5, A6
Ch1, DI	C4	6	C7
Ch1, DO	B4	19	C8
Ch1, L1+	-	-	B7

Table 99. DP820 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector <sup>(1)</sup>	TU830/TU833 Terminal
Ch1, L1+	-	-	B8
Ch1, Zp	A4	-	A7, A8
Ch2, CA+	C5	7	C9
Ch2, CA-	B5	20	C10
Ch2, VA_1	-	-	B9
Ch2, VA_2	-	-	B10
Ch2, Zp	A5	-	A9, A10
Ch2, CB+	C6	8	C11
Ch2, CB-	B6	21	C12
Ch2, VB_1	-	-	B11
Ch2, VB_2	-	-	B12
Ch2, Zp	A6	-	A11, A12
Ch2, CST+	C7	9	C13
Ch2, CST-	B7	22	C14
Ch2, VST_1	-	-	B13
Ch2, VST_2	-	-	B14
Ch2, Zp	A7	-	A13, A14
Ch2, DI	C8	10	C15
Ch2, DO	B8	23	C16
Ch2, L2+	-	-	B15
Ch2, L2+	-	-	B16
Ch2, Zp	A8	-	A15, A16

Table 99. DP820 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector <sup>(1)</sup>	TU830/TU833 Terminal
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)
0 V d.c. (ZP)	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure 225 shows the process connections for DP820 when installed on a TU810 or TU814 MTU.

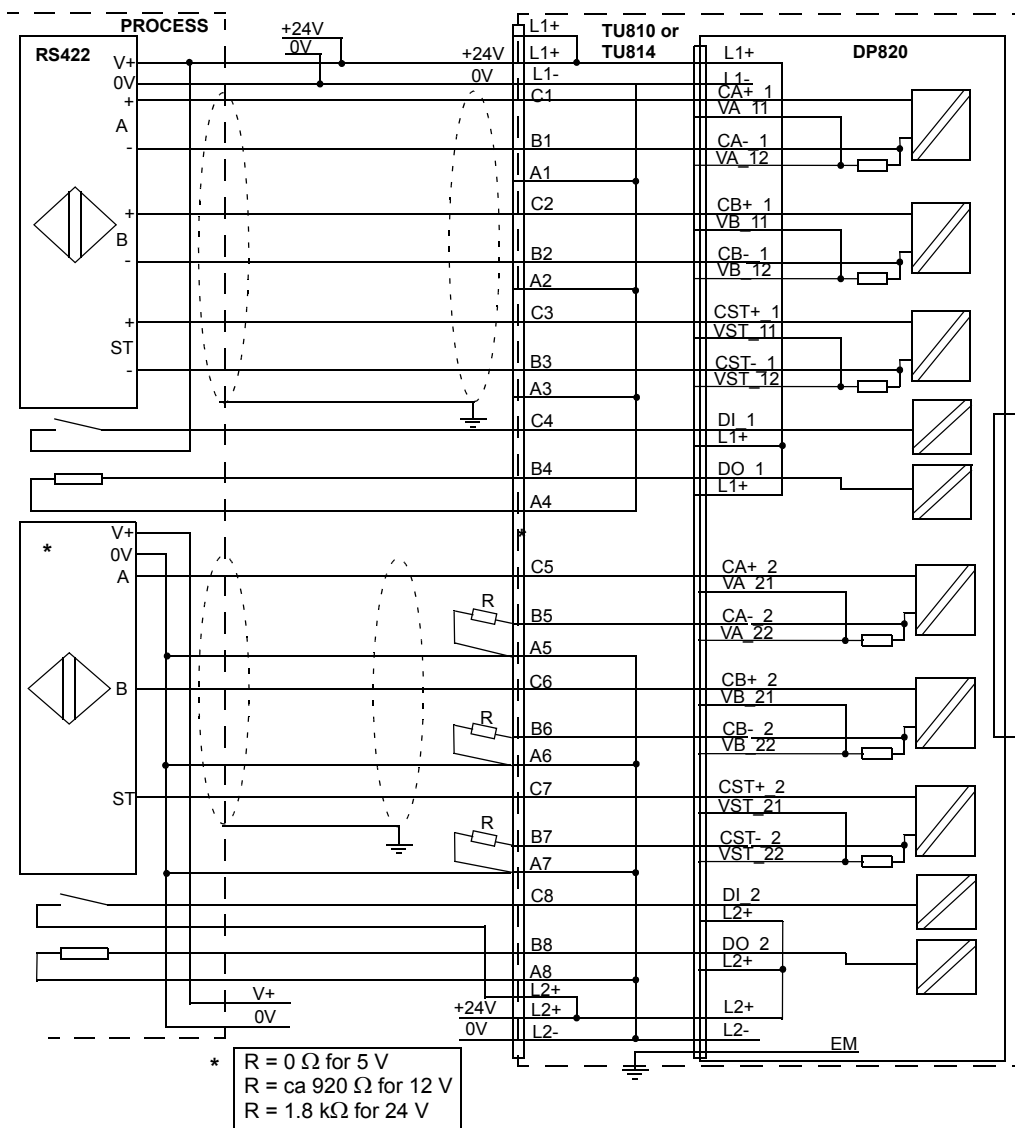


Figure 225. DP820 with TU810 or TU814 MTU Process Connections

Figure 226 shows the process connections for DP820 when installed on a TU812 MTU.

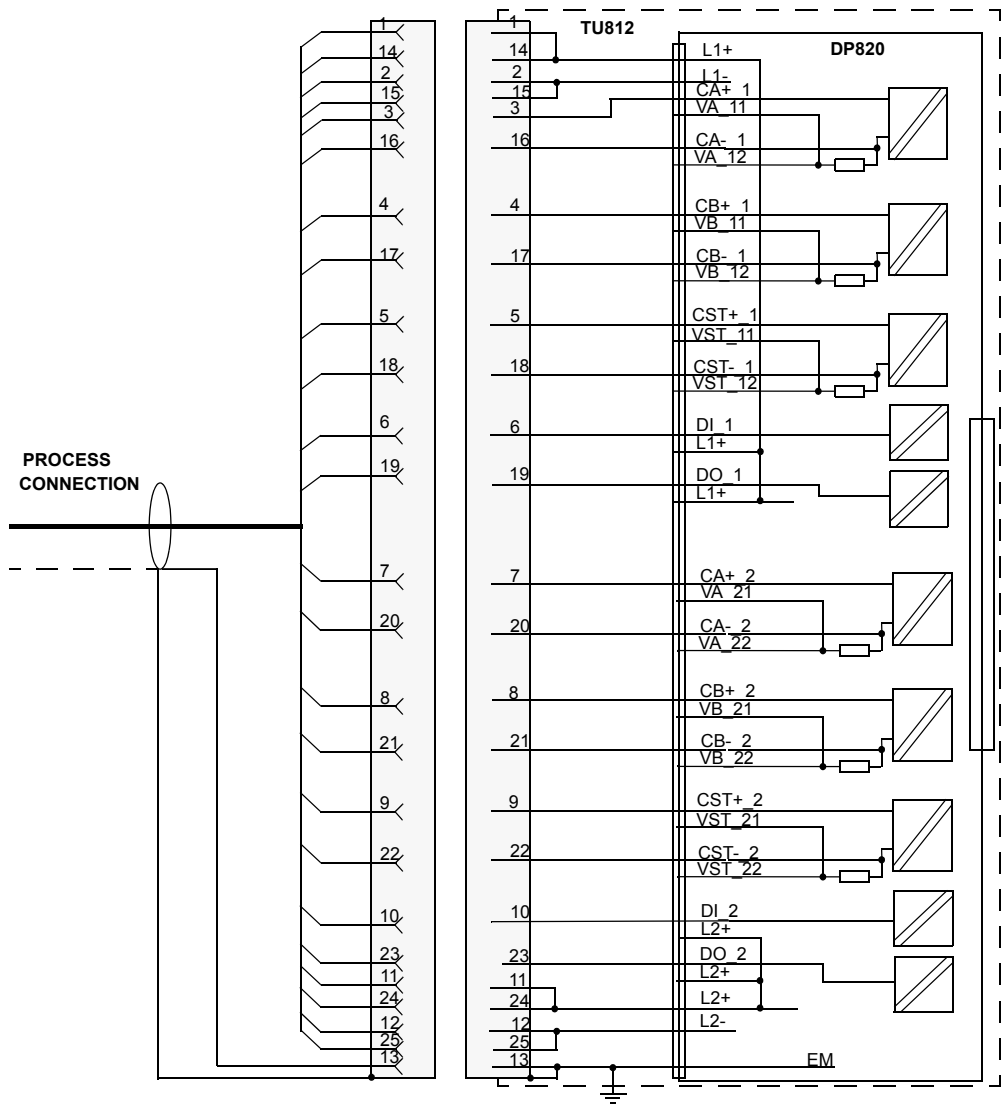


Figure 226. DP820 with TU812 MTU Process Connections



Figure 227 shows the process connections for DP820 when installed on a TU830 MTU, and with RS422 transducer connected to channel 1 and +5 V transducer to channel 2.

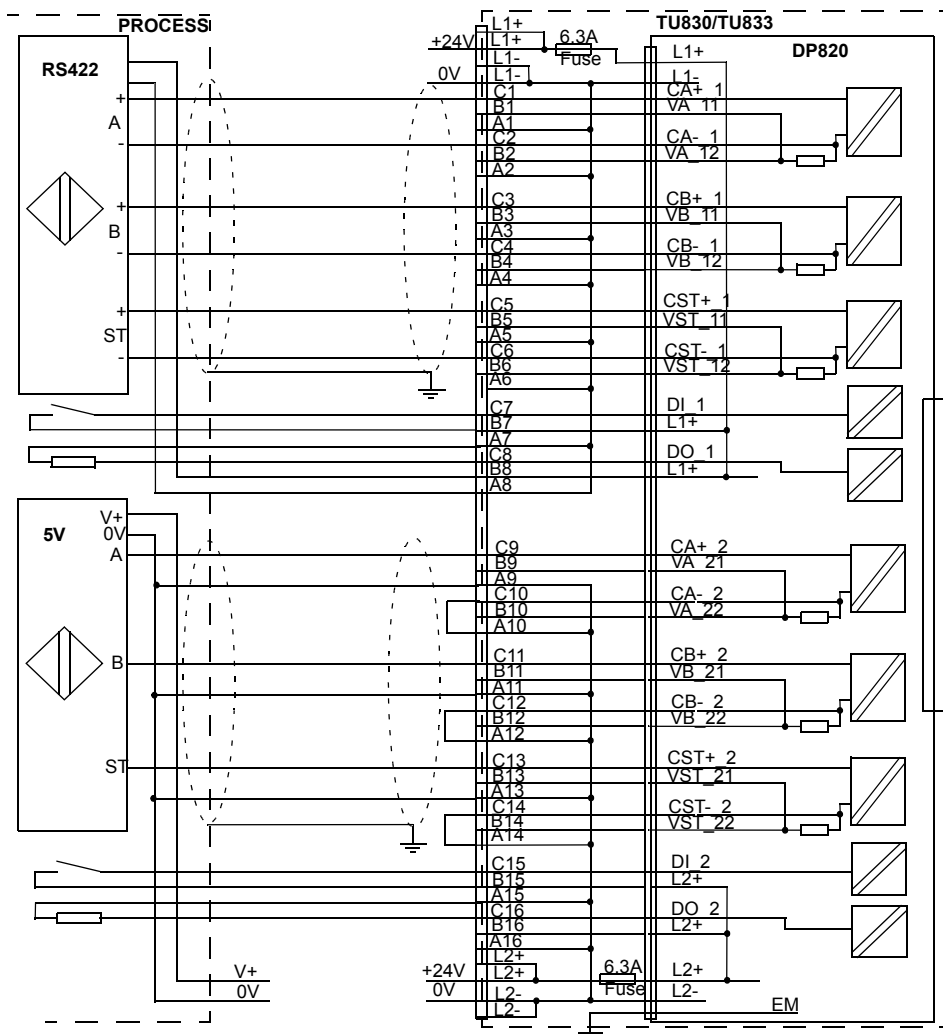


Figure 227. DP820 with TU830 MTU Process Connections and with Transducer Connections

Figure 228 shows the process connections for DP820 when installed on a TU830 MTU, and with +24 V transducer connected to channel 1 and +12 V transducer to channel 2.

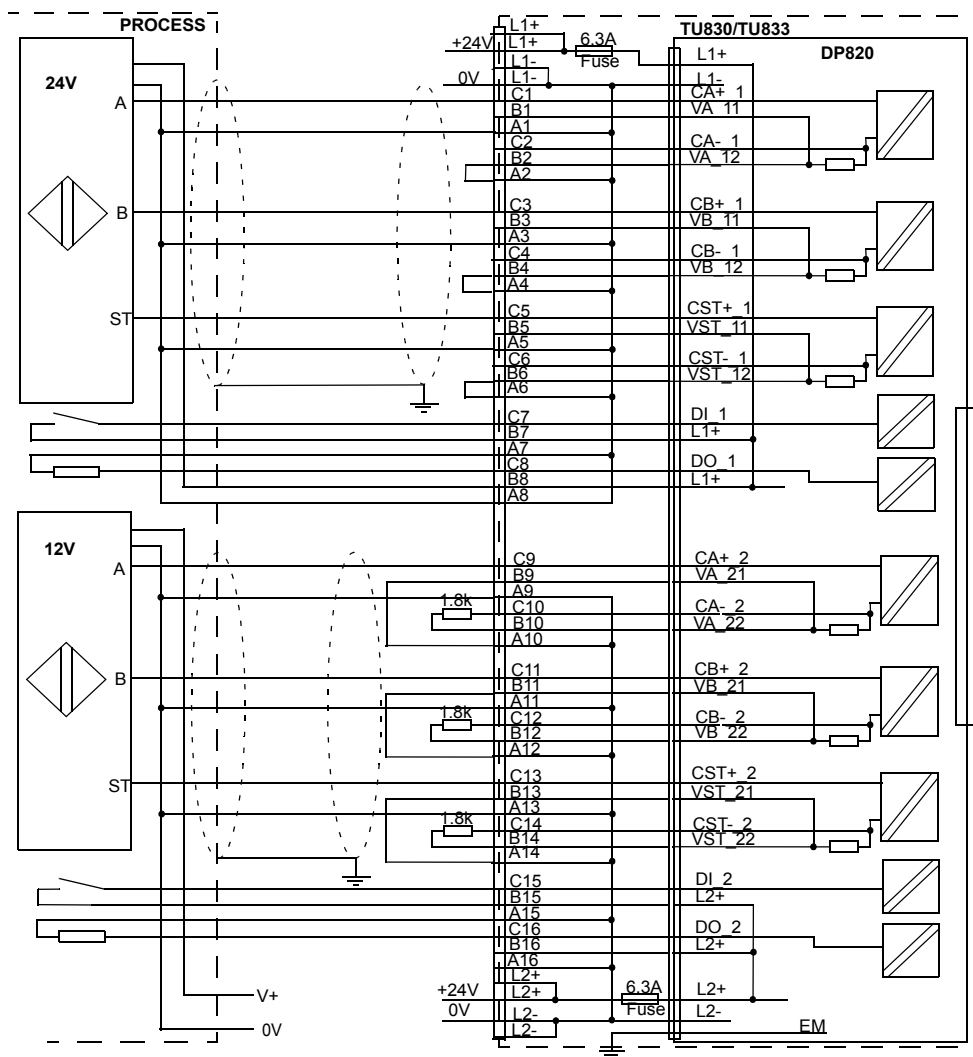


Figure 228. DP820 with TU830 MTU Process Connections and Transducer Connections

## DP840 Incremental Pulse Counter Module

### Features

- 8 channels.
- The modules can be used in both single and redundant applications.
- Interface for NAMUR, 12 V and 24 V transducer signal levels.
- Each channel can be configured for pulse count or frequency measurement.
- The inputs can also be read as DI signals.
- Pulse count by accumulation in a 16 bit counter.
- Frequency (speed) measurement 0.5 Hz - 20 kHz.
- Advanced on-board diagnostics.

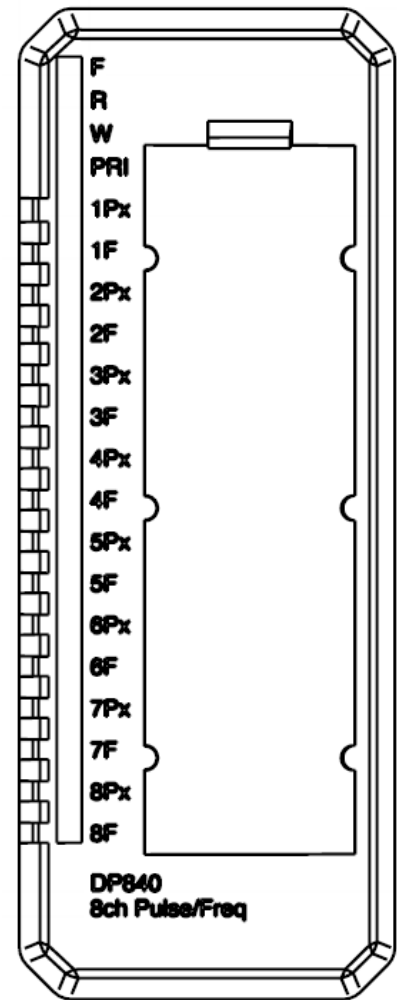
### Description

The DP840 module consists of 8 identical independent channels. Each channel can be used for pulse count or frequency (speed) measurement. The inputs can also be read as DI signals.

Each channel has a configurable input filter.

The module perform self-diagnostics cyclically. Module diagnostics include among other things:

- Transmitter power supply error, power supply error (process side), short circuit and open wire. These errors will be reported as External Channel Error.



- Counter supervision. This will be reported as Internal Channel Error.
- Error in data/address bus supervision will be reported as Module Error.
- Synchronization error will be reported as Module Warning.

In addition to the four module LEDs, DP840 has two LEDs per channel that indicate input state (Px - yellow) and channel fault (F - red). The Px LED glows if there is pulse (high signal) on the input, and F LED glows if the channel is faulty.

### Transducer Connection

Each channel has inputs for 12 V, 24 V and NAMUR input signals and a configurable transducer power output. The configurable transducer power is set on module (not channel wise) for all channels to either NAMUR, 12 V or 24V.

The module distributes the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2-wire or 3-wire transmitters. The transmitter power is supervised and current limited. The inputs can be supervised for short circuit and open wire. The supervision can be enabled/disabled per module (not channel wise).

The transducers should be connected by shielded twisted pair cable if the used filter time is less than 800µs.

The MTU have to be chosen with consideration to function and signal range, see [Table 100](#). Type of sensor to be used is defined by parameters.

The parameter set the sensor power output for NAMUR sensors to 8.2 V, for 12 V sensors to 12 V and for 24 V sensors to 24 V.

*Table 100. Function and Signal Range with Different MTUs*

MTU type	Redundant configuration			Single configuration		
	Namur sensors	12 V sensors	24 V sensors	Namur sensors	12 V sensors	24 V sensors
TU810/TU812/TU814	-	-	-	X		X
TU818	-	-	-	X	X	X
TU830/TU833	-	-	-	X	X	X

Table 100. Function and Signal Range with Different MTUs (Continued)

MTU type	Redundant configuration			Single configuration		
	Namur sensors	12 V sensors	24 V sensors	Namur sensors	12 V sensors	24 V sensors
TU842/TU843	-	X	X	-	-	-
TU844/TU845	X	X	X	-	-	-
TU852/	X	X	X	-	-	-
TU854	X	-	-	-	-	-

The parameter for internal and external shunt shall only be set to External when DP840 is used with TU844 or TU845 or TU854.

### Pulse Count Measurement

Pulse count is done by pulse accumulation in a 16 bit pulse counter. The pulse counter value is continuously loaded into the pulse register.

The value of the pulse register (that is, actual pulse count value) is read by the CPU, and transferred to the ModuleBus master.

### Frequency (speed) Measurement.

The frequency measurement function consists of two counters, that is, the SX and SR counters. The SX counter is used to count number of pulses ( $S_x$ ) from the unknown input frequency. The SR counter is used to count the number of pulses ( $S_r$ ) from a reference frequency source with frequency  $F_{REF}$ . The frequency value ( $F_x$ ) is calculated as:

$$F_x = F_{REF} \times S_x / S_r$$

The SX counter is implemented by a 12 bit up-counter. The SR counter is implemented by a 20 bit up-counter.

The SX and SR counters accumulates pulses during a measurement period.

The measurement interval for each channel defined by the user to 10 ms, 20 ms, 50 ms or 100 ms. By changing the measurement interval the user can select a suitable filter time (integration time) with respect to the application's requirements.

At the end of each measurement period the SX and SR registers are updated with the value of the SX and SR counters. The CPU reads the content in the SX and SR registers and calculates a frequency value.

The reference counter (SR) has a overflow detection function. The SR overflow will be activated if no incoming pulses have been detected during 3 s. When the CPU detects SR overflow, the frequency value is set to zero.

### Redundant Applications

In a redundant application one module is set to primary and one to backup. The primary module synchronizes the counter on the backup module every 10 seconds. After start-up it will take about 30 s before the backup has been synchronized.

### Technical Data

*Table 101. DP840 Incremental Pulse Counter Module Specifications*

Feature	DP840 Digital Pulse Counter
Number of channels	8
Power Supply voltage	24 V d.c. (19.2 to 30 V d.c.)
Max non-destructive voltage on inputs	30 V d.c.
Maximum field cable length	200 m
Cable type	Twisted pair <sup>(1)</sup>
Input filter time	10 $\mu$ s, 100 $\mu$ s, 800 $\mu$ s and 6400 $\mu$ s,

Table 101. DP840 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP840 Digital Pulse Counter
Frequency range at different filter time	10 $\mu$ s input filter: 0.5 Hz - 20 kHz 100 $\mu$ s input filter <sup>(2)</sup> : 0.5 Hz - 5 kHz 800 $\mu$ s input filter <sup>(2)</sup> : 0.5 Hz - 625 Hz 6400 $\mu$ s input filter <sup>(2)</sup> : 0.5 Hz - 78 Hz
Min pulse width ("1" or "0") at different filter time	10 $\mu$ s input filter: 10 $\mu$ s 100 $\mu$ s input filter: 100 $\mu$ s 800 $\mu$ s input filter: 800 $\mu$ s 6400 $\mu$ s input filter: 6400 $\mu$ s
Input thresholds, NAMUR	Open wire: $0 \text{ mA} \leq I_{IN} < 0.1 \text{ mA}$ Contact open: $0.1 \text{ mA} < I_{IN} < 1.6 \text{ mA}$ Contact closed: $1.6 \text{ mA} < I_{IN} < 6.0 \text{ mA}$ Short circuit: $I_{IN} > 6.0 \text{ mA}$
Input thresholds, 12V / 24 V With external resistor for cable supervision	Open wire: $0 \text{ V} \leq V_{IN} < 0.1 \text{ V}$ Contact open: $0.1 \text{ V} < V_{IN} < 1.6 \text{ V}$ Contact closed: $1.6 \text{ V} < V_{IN} < 6.0 \text{ V}$ Short circuit: $V_{IN} > 6.0 \text{ V}$
Input threshold, 12 V No resistors for cable supervision	Contact open: $0 \text{ V} \leq V_{IN} < 5.0 \text{ V}$ Contact closed: $V_{IN} > 5.0 \text{ V}$
Input threshold, 24 V No resistors for cable supervision	Contact open: $0 \leq V_{IN} < 8.3 \text{ V}$ Contact closed: $V_{IN} > 8.3 \text{ V}$
Maximum pulse frequency	20 kHz <sup>(3)</sup>
Hysteresis	$(I_{ON} - I_{OFF}) / \text{Input threshold} > 20\%$ or $(V_{ON} - V_{OFF}) / \text{Input threshold} > 20\%$
Input impedance	NAMUR: 1 k $\Omega$ , +/-10% 12 V range: 2.8 k $\Omega$ , +/-10% 24 V range: 4.0 k $\Omega$ , +/-10%

Table 101. DP840 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP840 Digital Pulse Counter
Sensor supply (voltage, max 20 mA per channel)	NAMUR: 8.2 V +/-10% 12 V range: 12 V +/-10% 24 V range: $V_{L+} - (3.0 \pm 1.0)$ V
Sensor supply (current)	38 mA +/- 10%
Max. measurement error, frequency measurement	Max relative error <sup>(4)</sup> : PRIT = 10 ms: 300 ppm PRIT = 20 ms: 150 ppm PRIT = 50 ms: 60 ppm PRIT = 100 ms: 30 ppm Max error in crystal oscillator: 120 ppm + 5 ppm/year Max absolute error = rel. error + oscillator error (PRIT = 10 ms, age < 16 year): 500 ppm (= 0.05%)
Min. sampling interval when used in pulse count mode	$f_{MAX}$ - Maximum expected input frequency: $2^{16} \times (1/f_{MAX})$ $f_{MAX} = 20$ kHz: 3.27 s
Synchronization accuracy	+/-1 pulse
Current consumption 5 V (Modulebus)	115 mA
External power supply consumption (Internal load + external load) Current consumption 24 V (process power supply, UPx)	NAMUR: 208 mA (max) (56 mA + 0.5 * sensor current) 12 V: 302 mA (max) (89 mA + 0.7 * sensor current) 24 V: 401 mA (max) (97 mA + sensor current)
Power dissipation	4 W
Process voltage supervision	1 channel



Table 101. DP840 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP840 Digital Pulse Counter
Module termination units, single applications	TU810, TU812, TU814, TU818, TU830, TU833
Module termination units, redundant applications	TU842/TU843, TU844/TU845 or TU852/TU854
MTU keying code	CF
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

- (1) Shielded cables for transmitters at filter times less than 800  $\mu$ s
- (2) Symmetric input pulse (i.e. 50% duty cycle)
- (3) Input channel pulse supervision does not work with pulse frequency <2 Hz
- (4) Relative error - Max difference in frequency measurement between two channels on the same module connected to the same source.

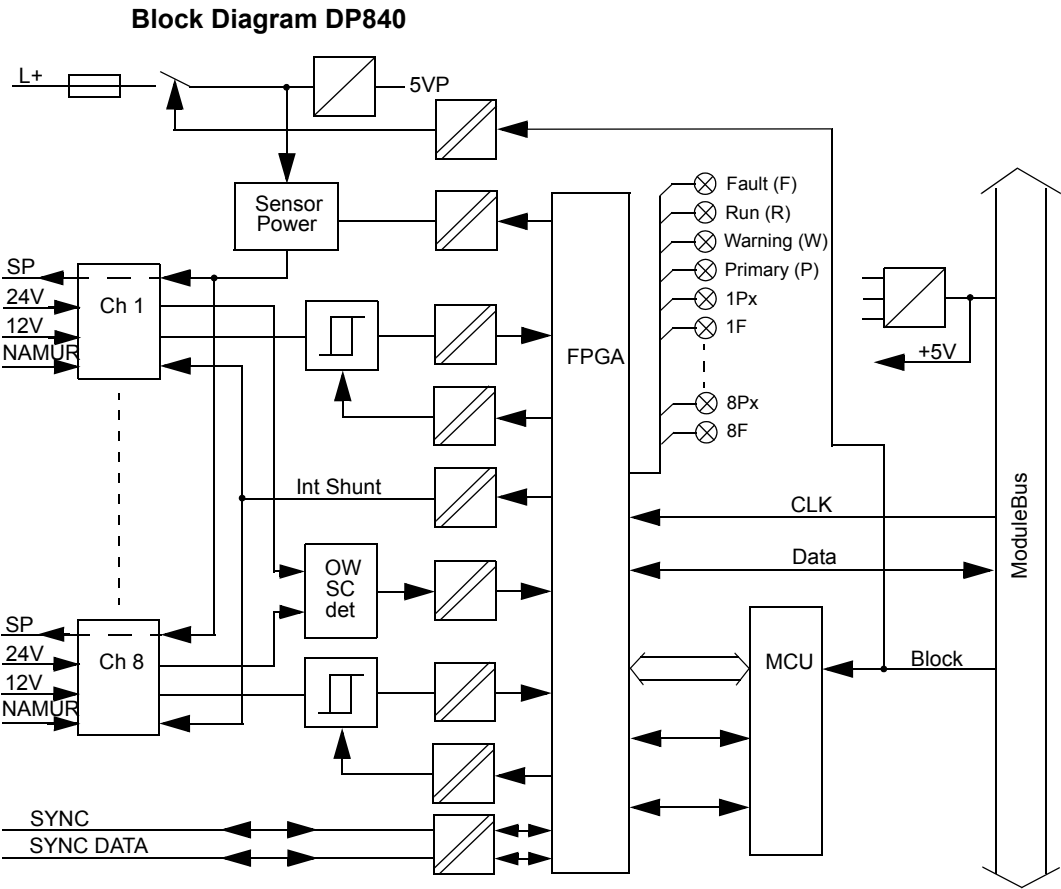


Figure 229. DP840 Block Diagram

**Process Connections***Table 102. DP840 Process Connections*

<b>Process Connection</b>	<b>TU810 or TU814 Terminal</b>	<b>TU812 D-Sub 25 Male Connector (1)</b>	<b>TU818 Terminal</b>	<b>TU830 or TU833 Terminal</b>	<b>TU842 or TU843 Terminal</b>	<b>TU844 or TU845 Terminal</b>	<b>TU852 Terminal</b>	<b>TU854 Terminal</b>
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+ (2)	1, 14 (X1a and X1b)	1, 14
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1- (2)	2, 25 (X1a and X1b)	2, 15
I1, NAMUR	C1	3	D1	C1	C1	B2	3 (X1a)	16
U1	-	-	C1	B1	B1	B1	3 (X1b)	3
ZP	-	-	-	A1	A1	A1	-	-
I1, 24 V	B1	16	B1	C2	C2	-	16 (X1a)	-
I1, 12 V	-	-	A1	B2	B2	-	16 (X1b)	-
ZP	A1	-	-	A2	A2	A2	-	-
I2, NAMUR	C2	4	D2	C3	C3	B4	4 (X1a)	17
U2	-	-	C2	B3	B3	B3	4 (X1b)	4
ZP	-	-	-	A3	A3	A3	-	-
I2, 24 V	B2	17	B2	C4	C4	-	17 (X1a)	-
I2, 12 V	-	-	A2	B4	B4	-	17 (X1b)	-
ZP	A2	-	-	A4	A4	A4	-	-
I3, NAMUR	C3	5	D3	C5	C5	B6	5 (X1a)	18
U3	-	-	C3	B5	B5	B5	5 (X1b)	5
ZP	-	-	-	A5	A5	A5	-	-

Table 102. DP840 Process Connections (Continued)

Process Connection	TU810 or TU814 Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830 or TU833 Terminal	TU842 or TU843 Terminal	TU844 or TU845 Terminal	TU852 Terminal	TU854 Terminal
I3, 24 V	B3	18	B3	C6	C6	-	18 (X1a)	-
I3, 12 V	-	-	A3	B6	B6	-	18 (X1b)	-
ZP	A3	-	-	A6	A6	A6	-	-
I4, NAMUR	C4	6	D4	C7	C7	B8	6 (X1a)	19
U4	-	-	C4	B7	B7	B7	6 (X1b)	6
ZP	-	-	-	A7	A7	A7	-	-
I4, 24 V	B4	19	B4	C8	C8	-	19 (X1a)	-
I4, 12 V	-	-	A4	B8	B8	-	19 (X1b)	-
ZP	A4	-	-	A8	A8	A8	-	-
I5, NAMUR	C5	7	D5	C9	C9	B10	7 (X1a)	20
U5	-	-	C5	B9	B9	B9	7 (X1b)	7
ZP	-	-	-	A9	A9	A9	-	-
I5, 24 V	B5	20	B5	C10	C10	-	20 (X1a)	-
I5, 12 V	-	-	A5	B10	B10	-	20 (X1b)	-
ZP	A5	-	-	A10	A10	A10	-	-
I6, NAMUR	C6	8	D6	C11	C11	B12	8(X1a)	21
U6	-	-	C6	B11	B11	B11	8(X1b)	8
ZP	-	-	-	A11	A11	A11	-	-
I6, 24 V	B6	21	B6	C12	C12	-	21 (X1a)	-
I6, 12 V	-	-	A6	B12	B12	-	21 (X1b)	-

Table 102. DP840 Process Connections (Continued)

Process Connection	TU810 or TU814 Terminal	TU812 D-Sub 25 Male Connector (1)	TU818 Terminal	TU830 or TU833 Terminal	TU842 or TU843 Terminal	TU844 or TU845 Terminal	TU852 Terminal	TU854 Terminal
ZP	A6	-	-	A12	A12	A12	-	-
I7, NAMUR	C7	9	D7	C13	C13	B14	9(X1a)	22
U7	-	-	C7	B13	B13	B13	9(X1b)	9
ZP	-	-	-	A13	A13	A13	-	-
I7, 24 V	B7	22	B7	C14	C14	-	22 (X1a)	-
I7, 12 V	-	-	A7	B14	B14	-	22 (X1b)	-
ZP	A7	-	-	A14	A14	A14	-	-
I8, NAMUR	C8	10	D8	C15	C15	B16	10(X1a)	23
U8	-	-	C8	B15	B15	B15	10(X1b)	10
ZP	-	-	-	A15	A15	A15	-	-
I8, 24 V	B8	23	B8	C16	C16	-	23 (X1a)	-
I8, 12 V	-	-	A8	B16	B16	-	23 (X1b)	-
ZP	A8	-	-	A16	A16	A16	-	-
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+ (2)	11, 24 (X1a and X1b)	11, 24
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2- (2)	12, 25 (X1a and X1b)	12, 25

(1) Pin 13 connected to connector body for EM.

Figure 230 shows the process connections for DP840 when installed on a TU810 or TU814 MTU.

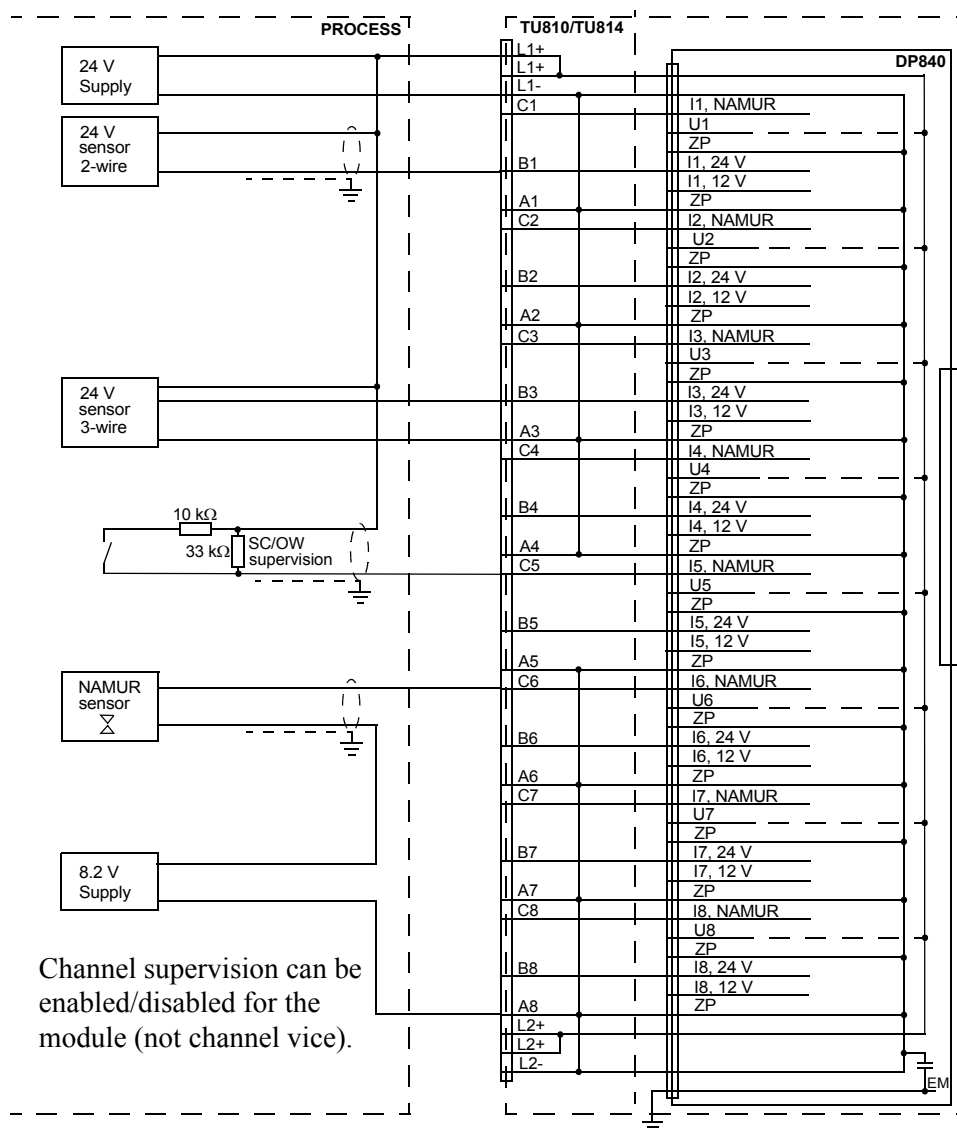


Figure 230. DP840 with TU810 or TU814 MTU Process Connections

Figure 231 shows the process connections for DP840 when installed on a TU812 MTU.

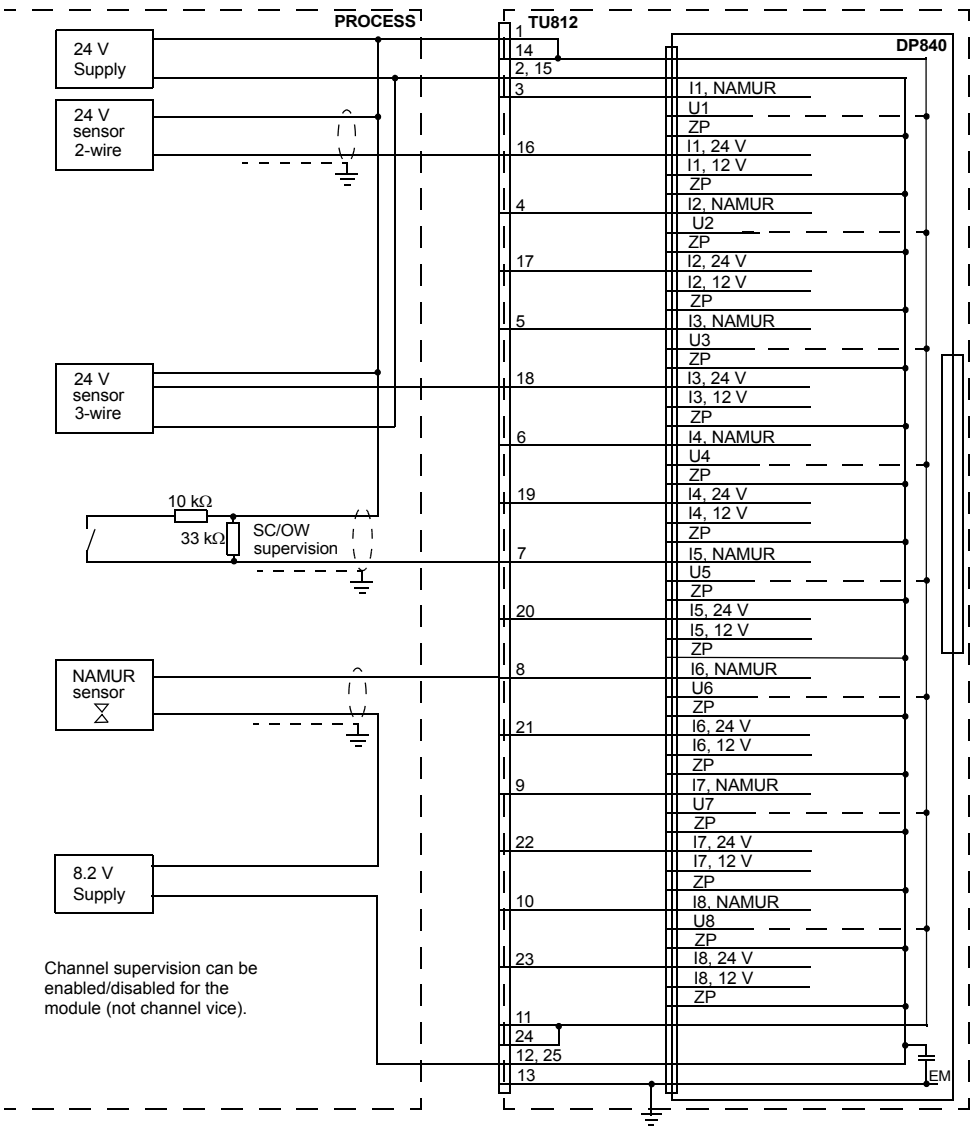


Figure 231. DP840 with TU812 MTU Process Connections

Figure 232 shows the process connections for DP840 when installed on a TU830 MTU.

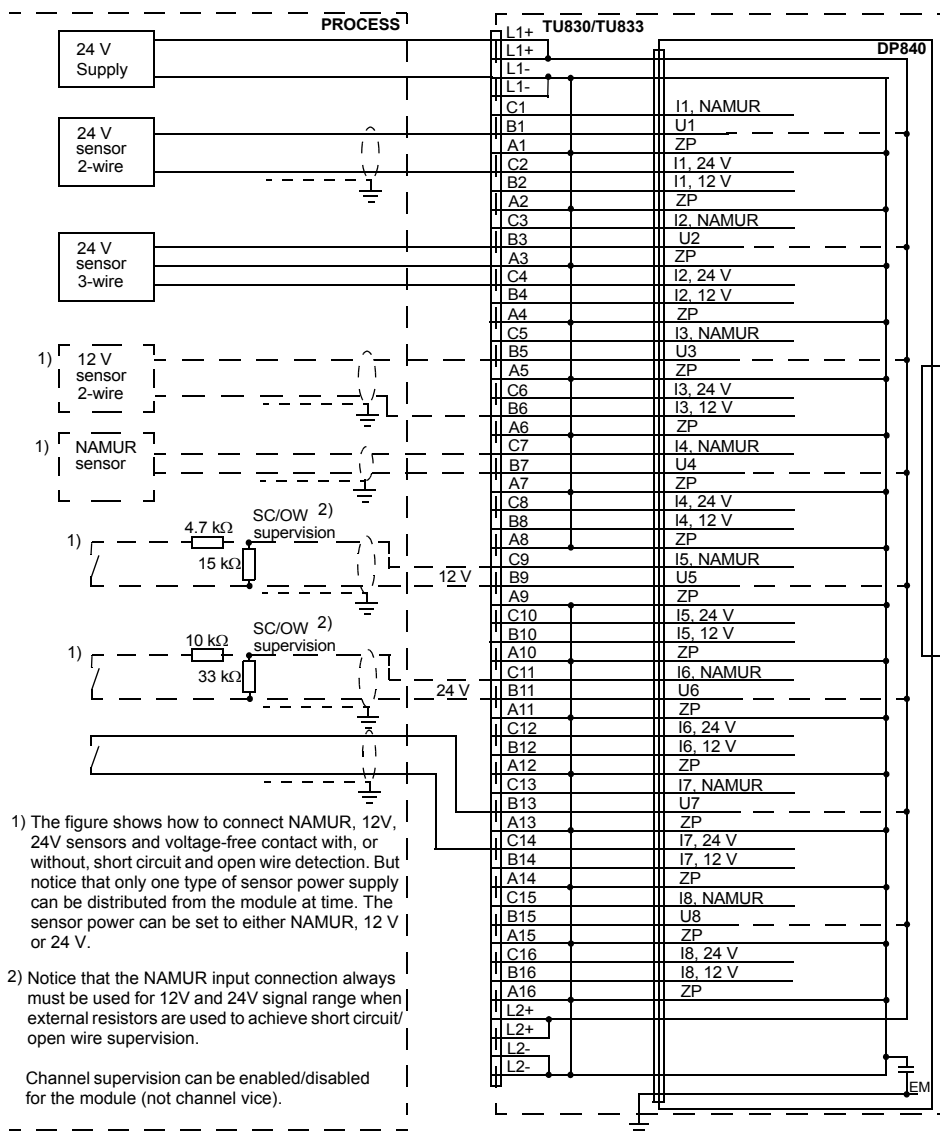


Figure 232. DP840 with TU830 MTU Process Connections



Figure 233 shows the process connections for DP840 when installed on a TU842 or TU843 MTU.

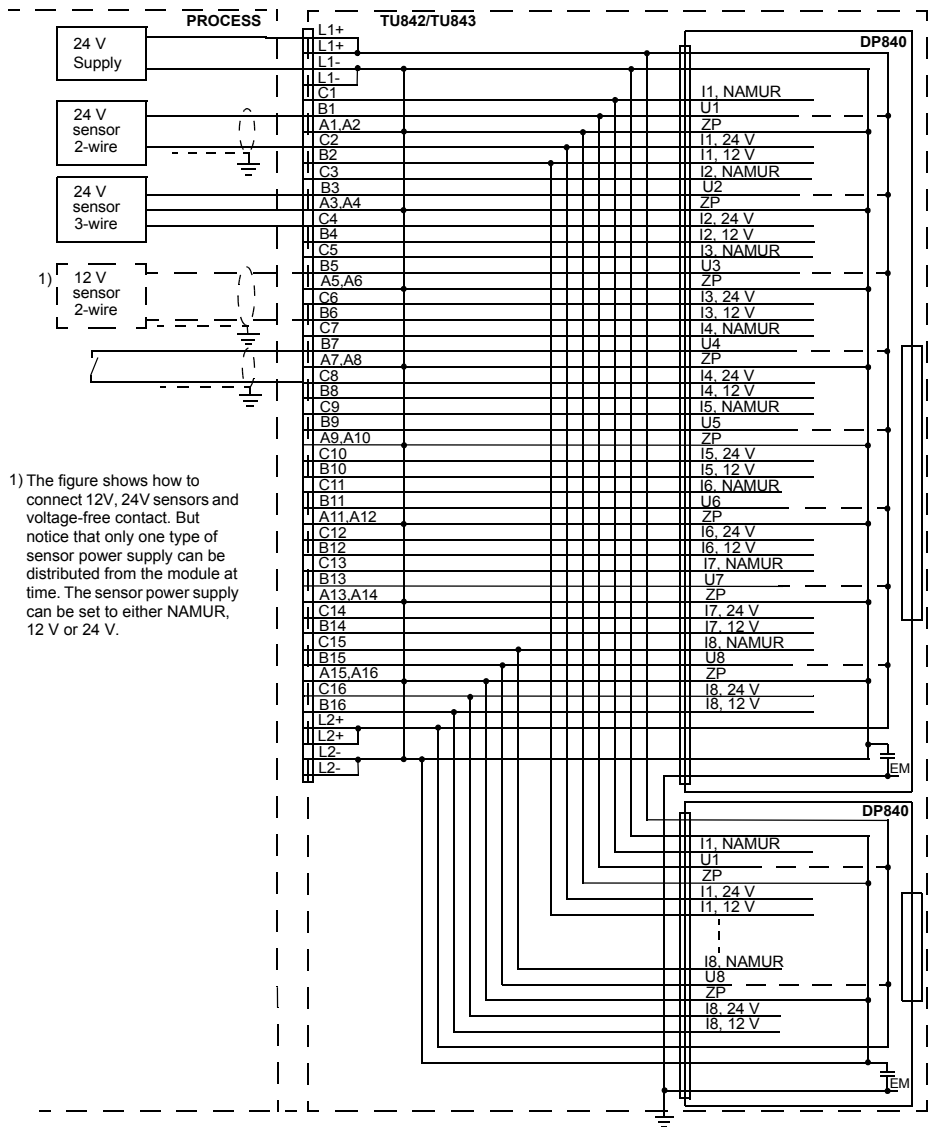


Figure 233. DP840 with TU842 or TU843 MTU Process Connections

Figure 234 shows the process connections for DP840 when installed on a TU844 or TU845 MTU.

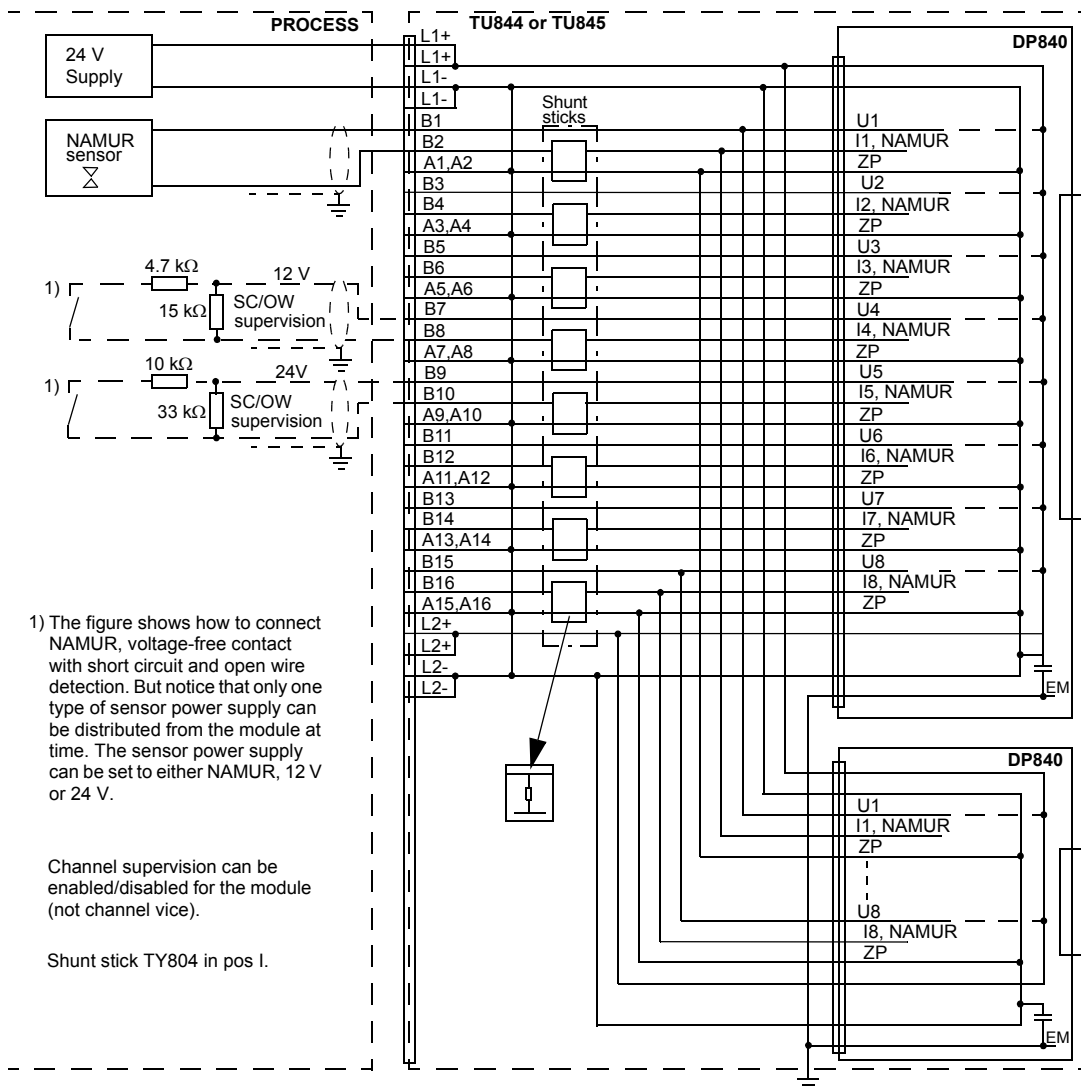


Figure 234. DP840 with TU844 or TU845 MTU Process Connections

Figure 235 shows the process connections for DP840 when installed on a TU818 Compact MTU.

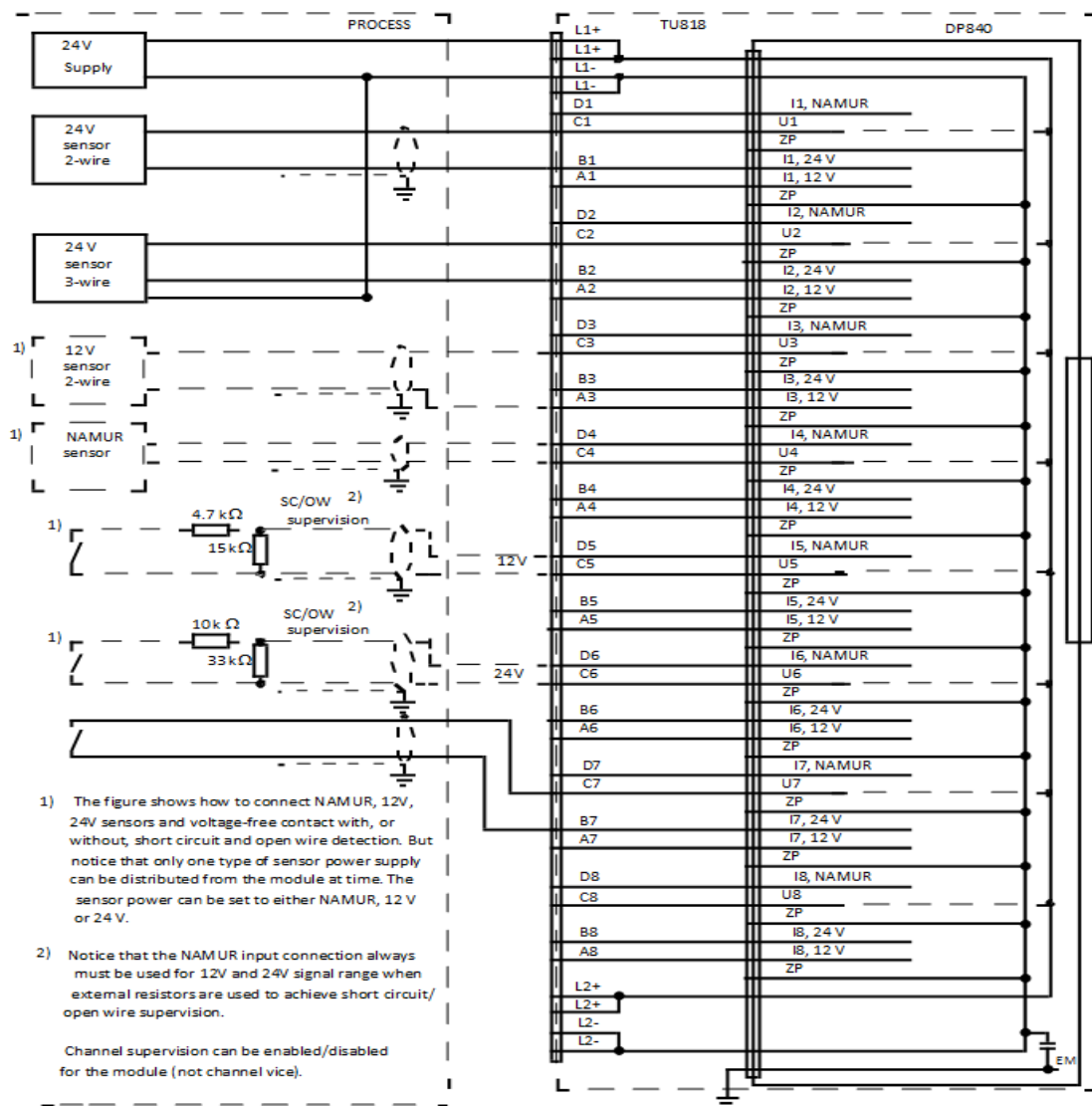


Figure 235. DP840 with TU818 Compact MTU Process Connections

Figure 236 shows the process connections for DP840 when installed on a TU852 MTU.

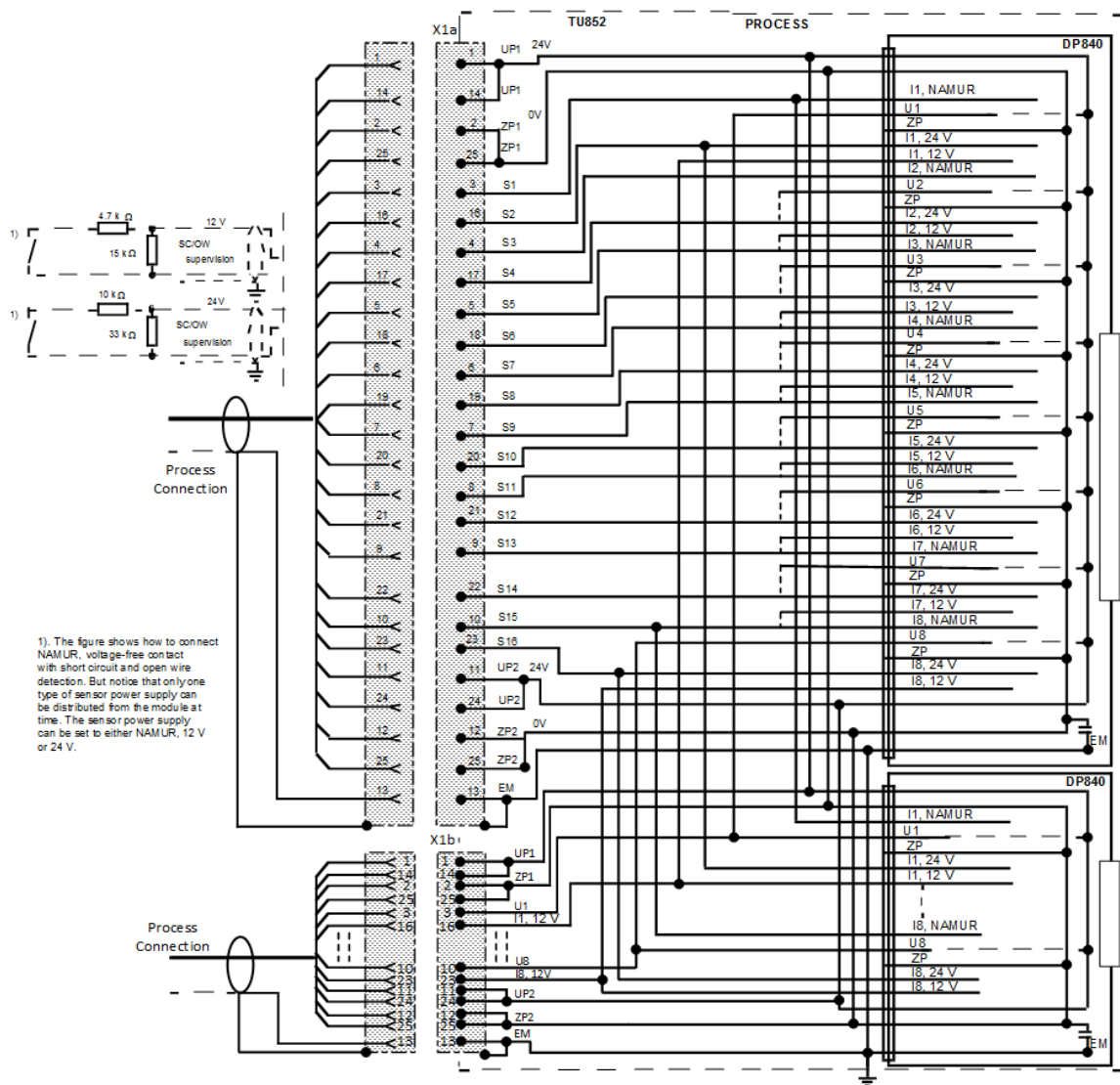


Figure 236. DP840 with TU852 MTU Process Connections

Figure 237 shows the process connections for DP840 when installed on a TU854 Redundant Horizontal MTU.

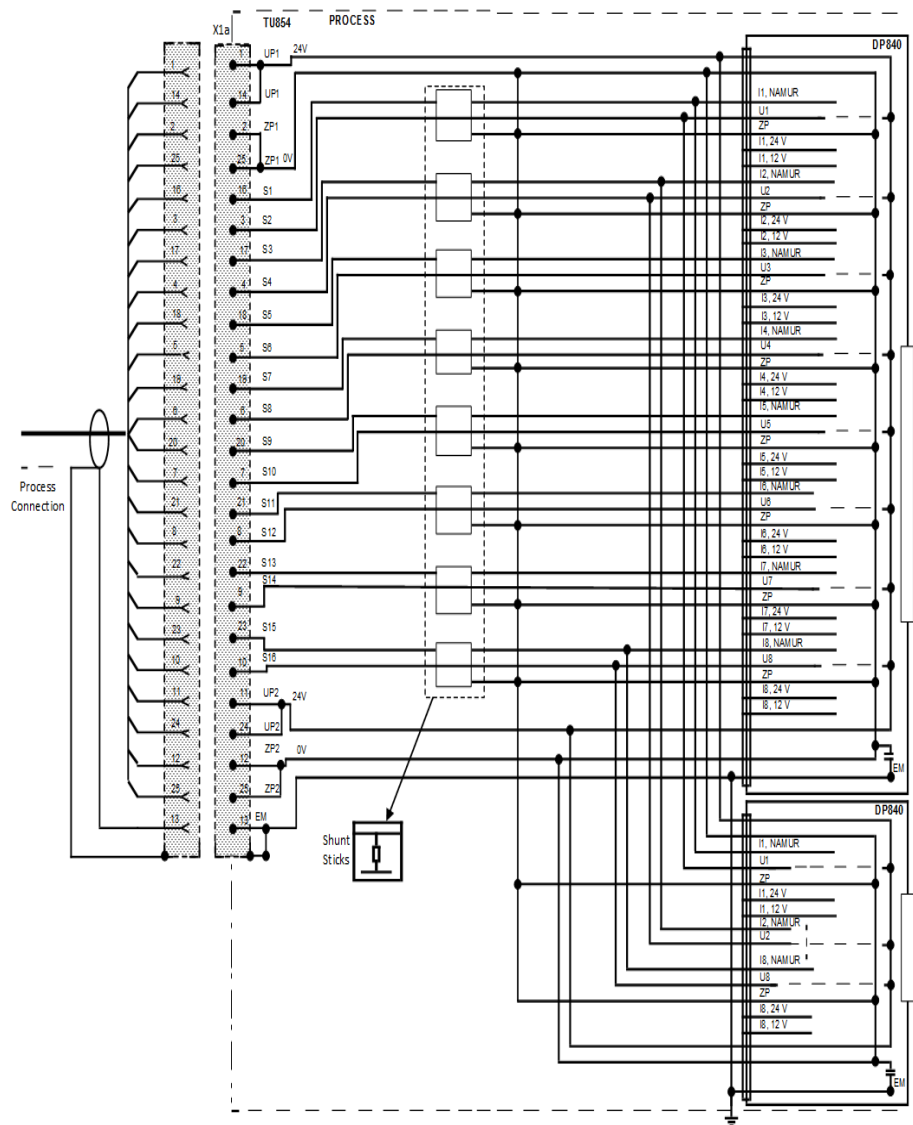
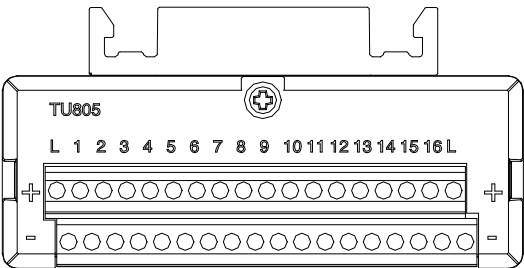


Figure 237. DP840 with TU854 Redundant Horizontal MTU Process Connections

# TU805 Terminal Unit

### Features

- Enables 2- and 3-wire connections of process signals.
- Direct mounting on the I/O module.
- Requires no extra space.



### Description

The TU805 is a 16 channel 50 V terminal unit for the S800L I/O modules DI801 and DO801. The Terminal Unit is a passive unit for distribution of external process power.

The module has 2 x 2 connections for external power and 2 x 16 connections for distribution.

### Technical Data

Table 103. TU805 Compact MTU Specifications

Item	Value
Process Connections	18 2 x 2 Process power terminals 2 x 16 Process power distribution terminals
Rated maximum continuous current per terminal	1 A

Table 103. TU805 Compact MTU Specifications (Continued)

Item	Value
Acceptable Wire Sizes	Solid: 0.2 - 1.5 mm <sup>2</sup> Stranded: 0.2 - 1.5 mm <sup>2</sup> , 24- 16 AWG Recommended torque 0.3 Nm
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

Block Diagram TU805

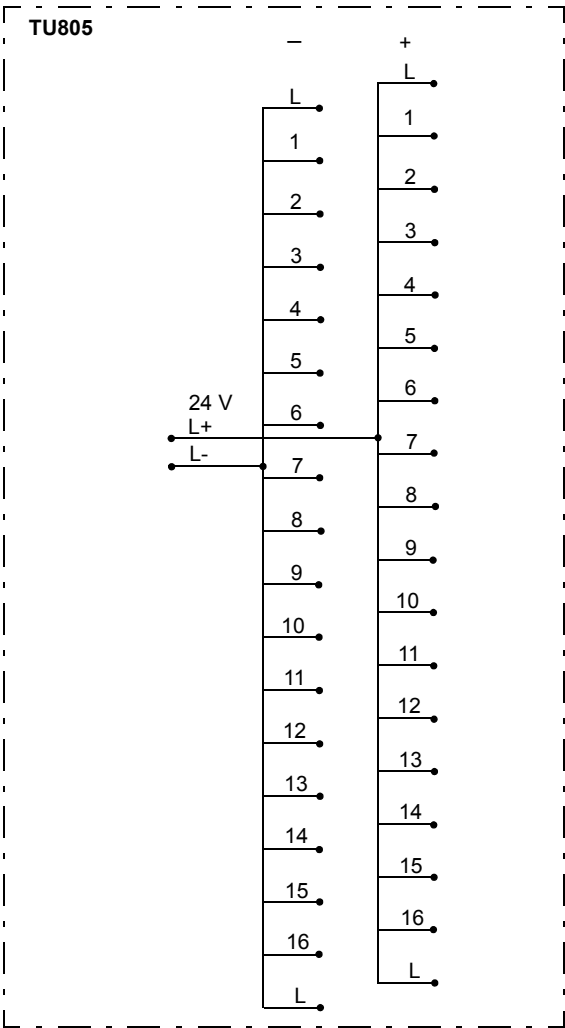


Figure 238. TU805 Block Diagram



## TU810/TU810V1 Compact MTU

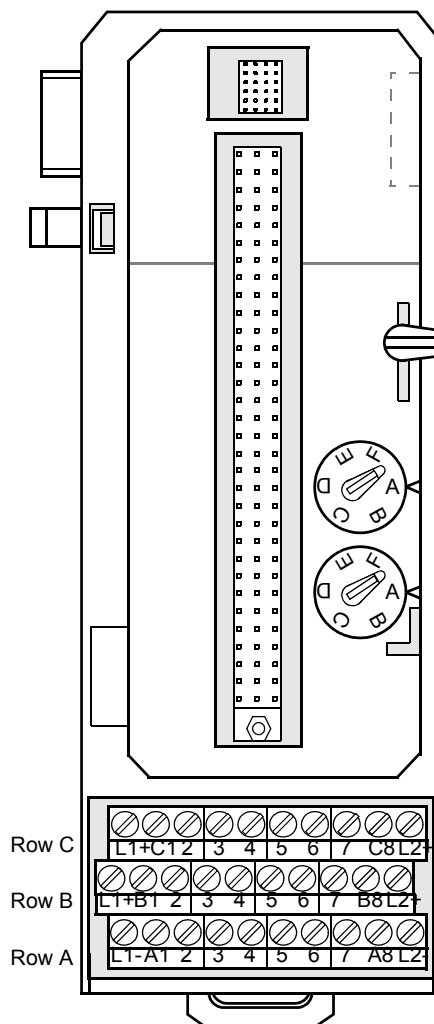
### Features

- 50 Volt applications - use with AI810, AI815, AI820, AI830, AI830A, AI835, AI835A, AI845, AO810, AO810V2, AO815, AO820, AO845, AO845A, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO815, DO840, DO880, DP820 and DP840 I/O modules.
- Compact installation of I/O modules using one-wire connections.
- Up to 16 channels of field signals and process power connections.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU810/TU810V1 is a 16 channel 50 V compact module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU810/TU810V1 MTU can have up to 16 I/O channels and two process voltage connections. The maximum rated voltage is 50 V and maximum rated



current is 2A per channel. Two mechanical keys are used to configure the MTU for different types of I/O modules.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 8 I/O connections, one process voltage connection and 5 common L- connections.

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

**Technical Data***Table 104. TU810/TU810V1 Compact MTU Specifications*

Item	Value
Process Connections	30 up to 16 I/O channels 2 x 2 Process power 5 x 2 Process power (0 V)
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable Wire Sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical Keys (2)	36 different combinations
I/O Module Lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52") including terminals

Table 104. TU810/TU810V1 Compact MTU Specifications (Continued)

Item	Value
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)

Connections

Table 105. TU810/TU810V1 Process Connection Screw Terminals (X1)

Position	Row A	Row B	Row C
1	L1-	L1+	L1+
2	A1 (L1-)	B1	C1
3	2 (L1-)	2	2
4	3 (L1-)	3	3
5	4 (L1-)	4	4
6	5 (L2-)	5	5
7	6 (L2-)	6	6
8	7 (L2-)	7	7
9	A8 (L2-)	B8	C8
10	L2-	L2+	L2+

Block Diagram TU810/TU810V1

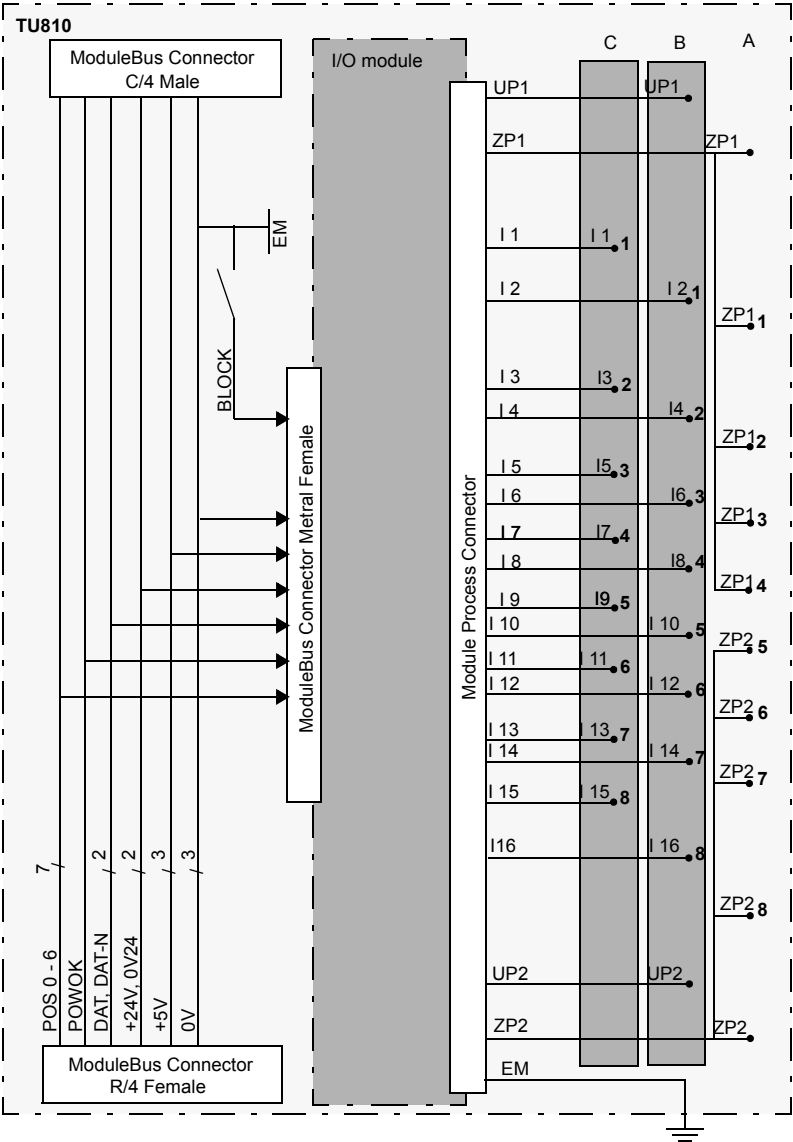


Figure 239. TU810/TU810V1 Block Diagram

## TU811/TU811V1 Compact MTU

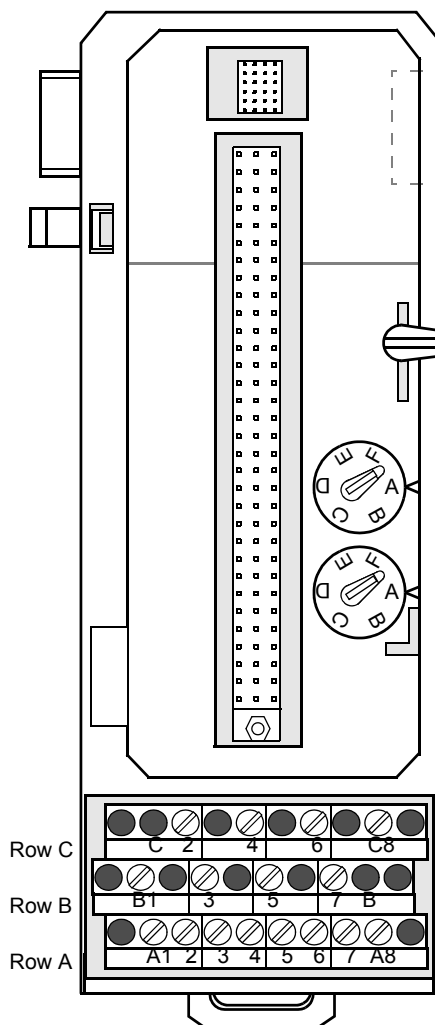
### Features

- 250 Volt applications - use with DI820, DI821, DO820, and DO821 I/O modules.
- Compact installation of I/O modules.
- Up to 8 isolated channels of field signals.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU811/TU811V1 is a 8 channel 250 V compact module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU811/TU811V1 MTU can have up to 8 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel. Two mechanical keys are used to configure the MTU for different types of I/O modules.



The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections.

The TU811/TU811V1 is primarily intended for modules with individually isolated channels.

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

**Technical Data***Table 106. TU811/TU811V1 Compact MTU Specifications*

Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel)
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)



**Connections***Table 107. TU811/TU811V1 Process Connection Screw Terminals (X1)*

<b>Position <sup>(1)</sup></b>	<b>Row A</b>	<b>Row B</b>	<b>Row C</b>
1	NC	NC	NC
2	A1	B1	NC
3	2	NC	C2
4	3	3	NC
5	4	NC	4
6	5	5	NC
7	6	NC	6
8	7	7	NC
9	A8	NC	C8
10	NC	NC	NC

(1) All positions marked NC are not mounted in the connector.

## Block Diagram TU811/TU811V1

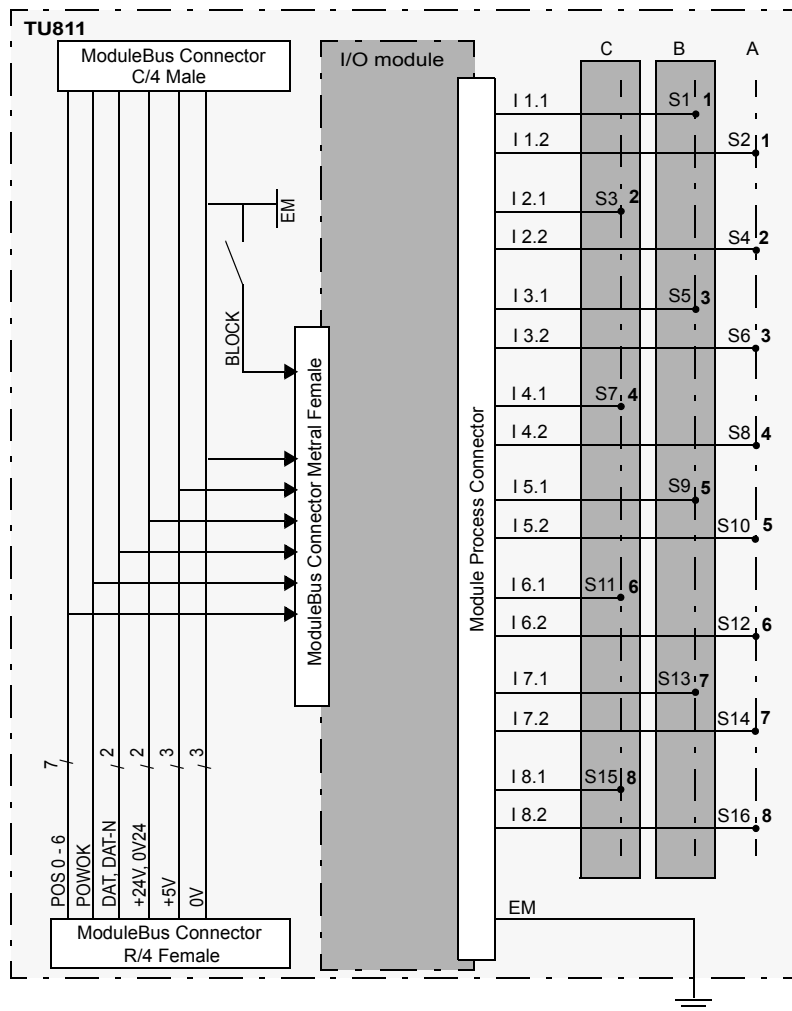


Figure 240. TU811/TU811V1 Block Diagram

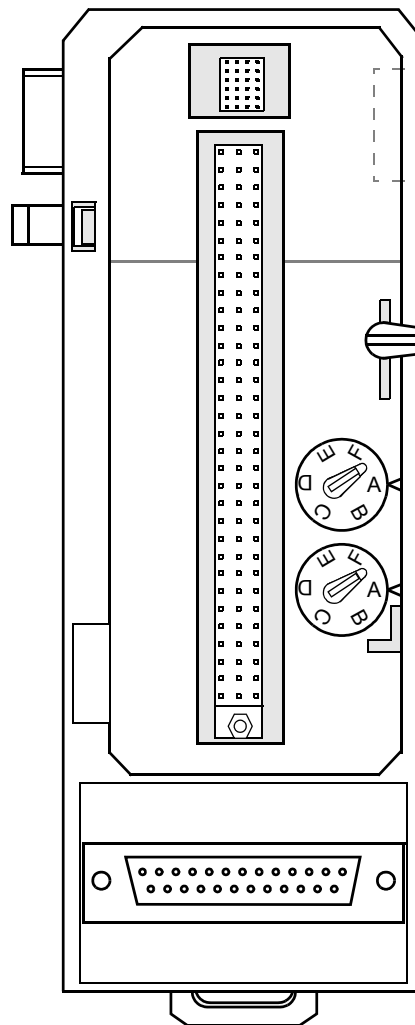
## TU812/TU812V1 Compact MTU

### Features

- 50 Volt applications - use with AI810, AI815, AI820, AI830, AI830A, AI835, AI835A, AI845, AO810, AO810V2, AO815, AO820, AO845, AO845A, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO840, DO880, DP820 and DP840 I/O modules.
- Compact installation of I/O modules using D-sub connector.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU812/TU812V1 is a 50 V compact module termination unit (MTU) for the S800 I/O system with 16 signal connections. The MTU is a passive unit used for connection of the field wiring. It also contains a part of the ModuleBus.



The TU812/TU812V1 MTU can have up to 16 I/O signals. The maximum rated voltage is 50 V and maximum rated current is 2A per channel. The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal connector is a D-Sub 25 pin (male).

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

Technical Data

Table 108. TU812/TU812V1 Compact MTU Specifications

Item	Value
Process connections	25 pin (male) D-Sub connector up to 16 I/O signals
Rated maximum continuous current per I/O channel	2 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation

Table 108. TU812/TU812V1 Compact MTU Specifications (Continued)

Item	Value
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)
Rated max. continuous current per process voltage connection Up/Zp.	5 A

### Connections

Table 109. TU812/TU812V1 Process Connection D-Sub Connector (X1)

Position	Row A
1	UP1
2	ZP1
3	S1
4	S3
5	S5
6	S7
7	S9

Table 109. TU812/TU812V1 Process Connection D-Sub Connector (X1)  
(Continued)

Position	Row A
8	S11
9	S13
10	S15
11	UP2
12	ZP2
13	EM
14	UP1
15	ZP1
16	S2
17	S4
18	S6
19	S8
20	S10
21	S12
22	S14
23	S16
24	UP2
25	ZP2

Block Diagram TU812/TU812V1

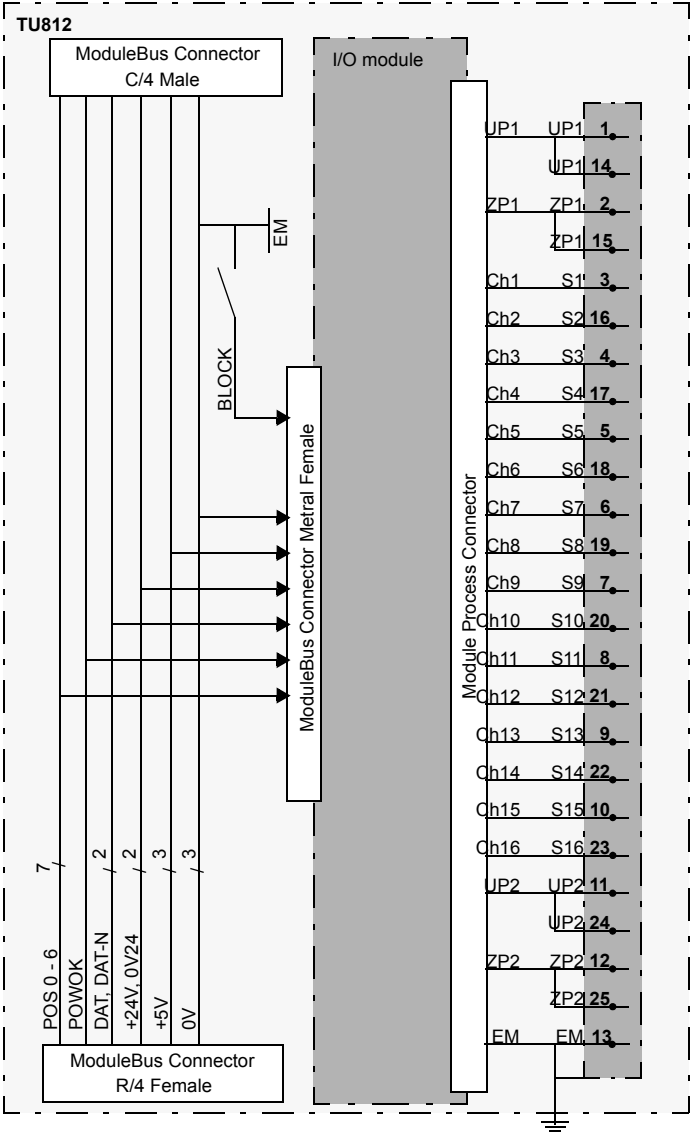


Figure 241. TU812/TU812V1 Block Diagram

## TU813 Compact MTU

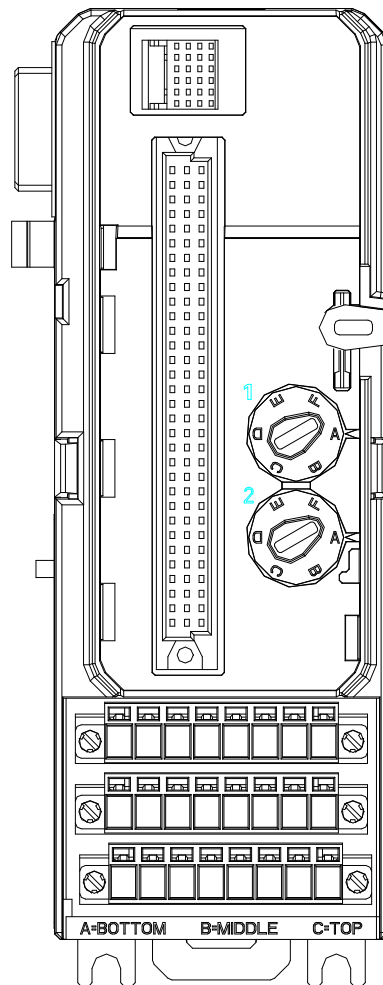
### Features

- 250 Volt applications - use with DI820, DI821, DI825, DO820, DO821 and AI825 I/O modules.
- Compact installation of I/O modules.
- Up to 8 isolated channels of field signal connections with crimped snap-in connectors.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU813 is a 8 channel 250 V compact module termination unit (MTU) for the S800 I/O. The TU813 has three rows of crimp snap-in connectors for field signals and process power connections. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The maximum rated voltage is 250 V and maximum rated current is 3 A per channel. Two mechanical keys are used to configure the MTU for different types of I/O modules.





The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the I/O module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the I/O module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections.

The TU813 is primarily intended for modules with individually isolated channels.

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal.

Crimp terminals are provided for connection to field wiring and insertion into the 3 snap-in connectors. Once the contacts are correctly placed in the connectors, the cable can be easily inserted and removed without future wiring errors. This assembly function can be performed before the cables are delivered to the site.

Crimp snap-in connectors are not included in TU813.



To provide protection from hazardous voltage, all plugs must be connected.

**Technical Data***Table 110. TU813 Compact MTU Specifications*

Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel)
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes attached to crimped snap-in connectors (3) <sup>(1)</sup>	Stranded: 0.2 - 0.5 mm <sup>2</sup> , 24 - 20 AWG 0.5 - 1.0 mm <sup>2</sup> , 20 - 18 AWG 1.5 - 2.5 mm <sup>2</sup> , 16 - 14 AWG
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Insulation test voltage Channel to EM Channel to Channel 24 V modulebus to EM	2300 V a.c. 1350 V a.c. 500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals

Table 110. TU813 Compact MTU Specifications (Continued)

Item	Value
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)

(1) 3 pcs of cable plugs are supplied with TU813 (1809792 MSTBC 2.5/8/STZF-5.08)

Connections

Table 111. TU813 Process Connection Screw Terminals (XI)

Position <sup>(1)</sup>	Row A	Row B	Row C
1	NC	NC	NC
2	A1	B1	NC
3	2	NC	C2
4	3	3	NC
5	4	NC	4
6	5	5	NC
7	6	NC	6
8	7	7	NC
9	A8	NC	C8
10	NC	NC	NC

(1) All positions marked NC are not mounted in the connector.

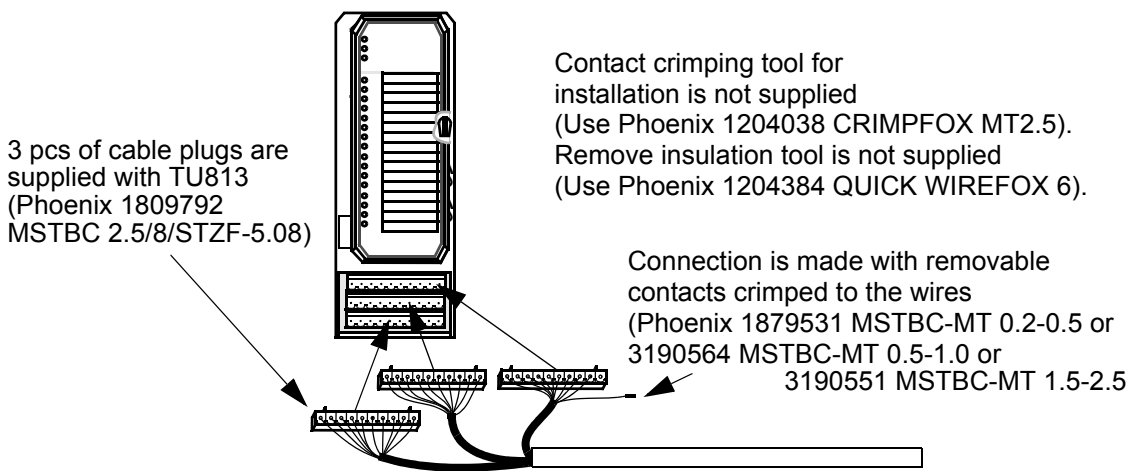


Figure 242. Connections to TU813

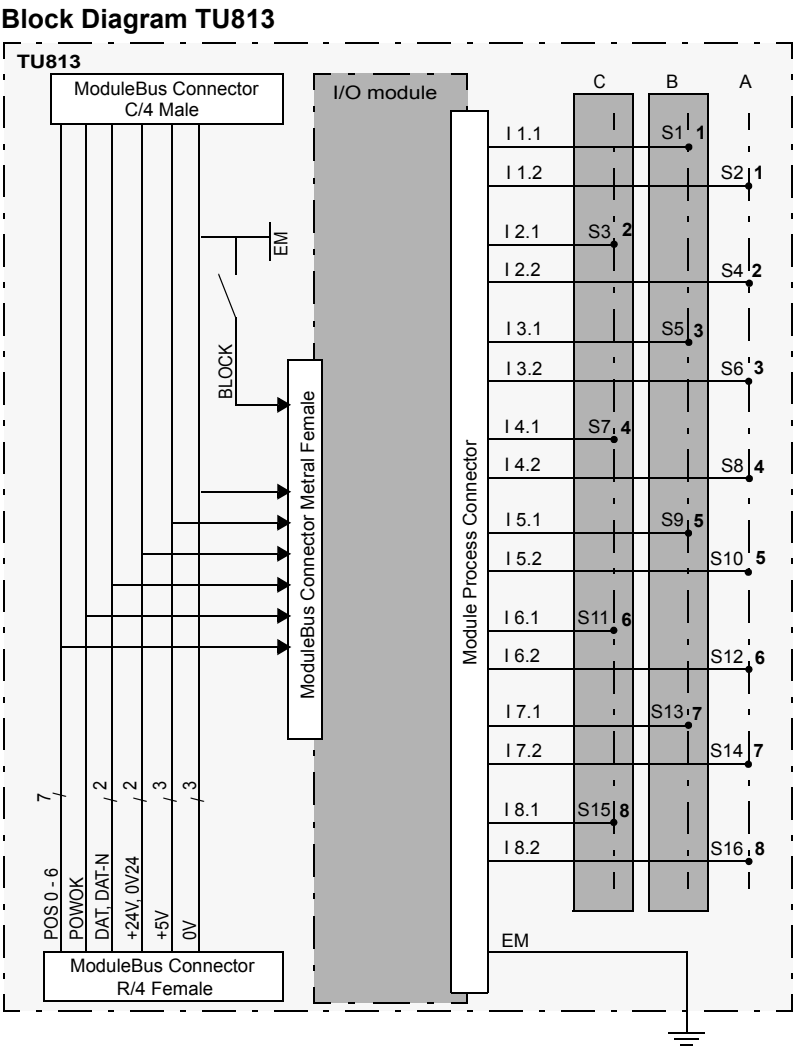


Figure 243. TU813 Block Diagram

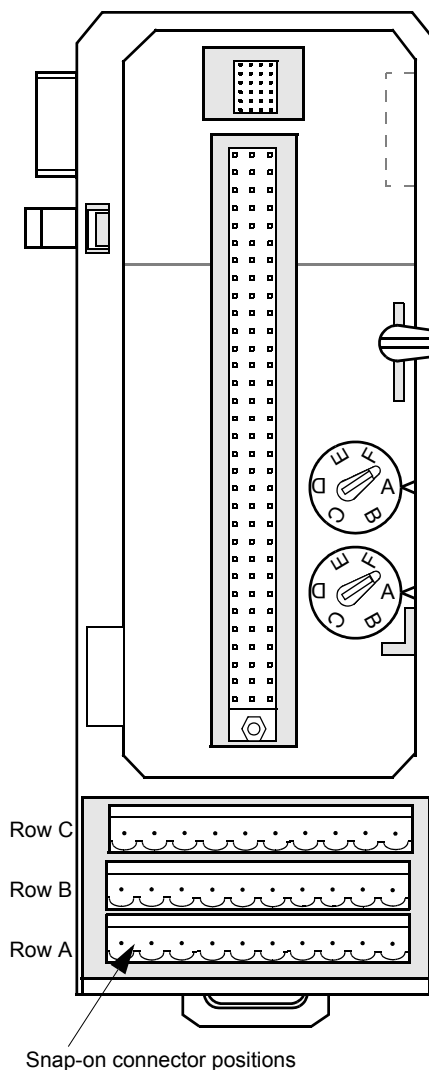
## TU814/TU814V1 Compact MTU

### Features

- 50 Volt applications - use with AI810, AI815, AI820, AI830, AI835A, AI835, AI845, AO810, AO810V2, AO815, AO820, AO845, AO845A, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO815, DO840, DO880, DP820 and DP840 I/O modules.
- Compact installation of I/O modules using one-wire connections.
- Up to 16 channels of field signals and process power connections with crimped snap-in connectors.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU814/TU814V1 is a 16 channel 50 V compact module termination unit (MTU) for the S800 I/O. The TU814/TU814V1 has three rows of crimp snap-in connectors for field signals and process power connections. The MTU is a passive unit



used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU814/TU814V1 MTU can have up to 16 I/O channels and two process voltage connections. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel. Two mechanical keys are used to configure the MTU for different types of I/O modules.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 8 I/O connections, 2 process voltage connection and 5 common L- connections.

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

Crimp terminals are provided for connection to field wiring and insertion into the 3 snap-on connectors. Once the contacts are correctly placed in the connectors, the cable can be easily inserted and removed without future wiring errors. This assembly function can be performed before the cables are delivered to the site.

Cable plugs and crimp snap in connectors are not included in TU814/TU814V1.



**Technical Data***Table 112. TU814/TU814V1 Compact MTU Specifications*

Item	Value
Process connections	30 up to 16 I/O channels 2 x 2 Process power 2 x 5 Process power (0 V)
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution: Maximum 24V current distribution:	1.5 A 1.5 A
Acceptable wire sizes attached to crimped snap-in connectors (3) <sup>(1)</sup>	Stranded: 0.2 - 0.5 mm <sup>2</sup> , 24 - 20 AWG 0.5 - 1.0 mm <sup>2</sup> , 20 - 18 AWG 1.5 - 2.5 mm <sup>2</sup> , 16 - 14 AWG
Mechanical keys (2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals

Table 112. TU814/TU814V1 Compact MTU Specifications (Continued)

Item	Value
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)

(1) 3 pcs of cable plugs are supplied with TU814/TU814V1 (1808890 MSTBC 2.5/10-ST-5.08)

Connections

Table 113. TU814/TU814V1 Process Connection Crimp Connector (X1)

Position	Row A	Row B	Row C
1	L1-	L1+	L1+
2	A1 (L1-)	B1	C1
3	2 (L1-)	2	2
4	3 (L1-)	3	3
5	4 (L1-)	4	4
6	5 (L2-)	5	5
7	6 (L2-)	6	6
8	7 (L2-)	7	7
9	A8 (L2-)	B8	C8
10	L2-	L2+	L2+

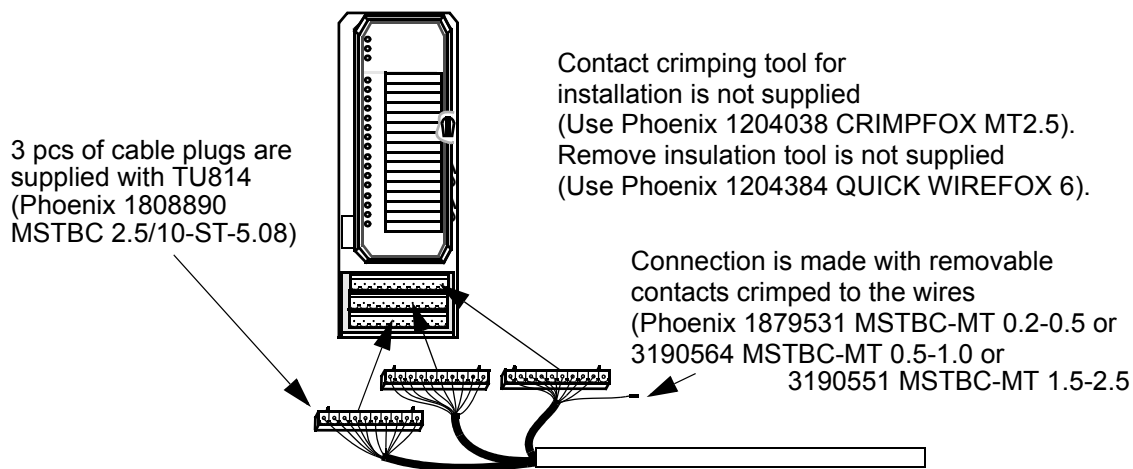


Figure 244. Connections to TU814/TU814V1

Block Diagram TU814/TU814V1

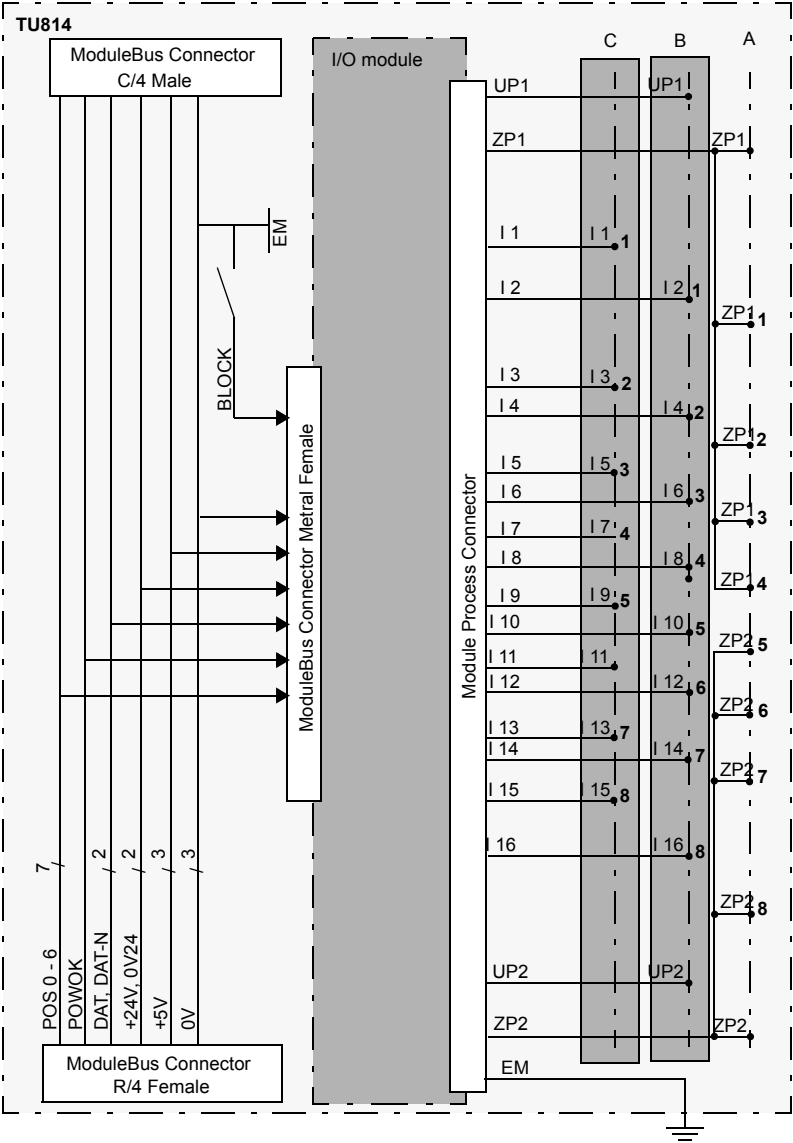


Figure 245. TU814/TU814V1 Block Diagram

## TU818 Compact MTU

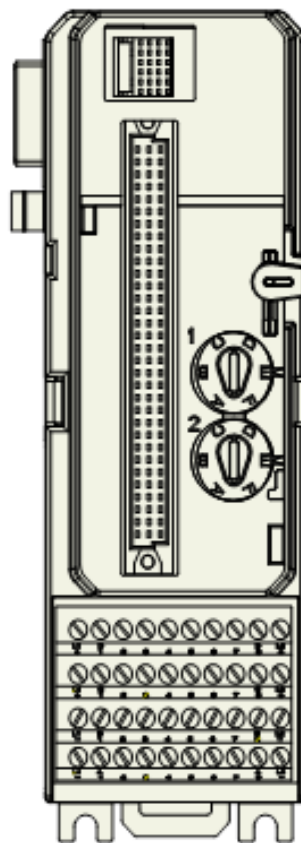
### Features

- 50 Volt applications - use with AI810, AI815, AI835A, AI843, AI845, DI810, DI811, DI818, DI830, DI831, DI840, DI880, DI885, DO818, DP840 I/O modules.
- Compact installation of I/O modules using one-wire or two-wire (depends on I/O module type) connections.
- Up to 32 channels of field signals and process power connections.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU818 is a 32 channel 50 V compact module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU818 MTU can have up to 32 I/O channels and two process voltage connections. The maximum rated voltage is 50V, maximum rated current is 2.5A per channel and 8A per process voltage connection. The Mechanical keys are used for the I/O module slot to configure the MTU for different types of I/O modules.



The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver. The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 16 I/O connections. The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

**Technical Data***Table 114. TU818 Compact MTU Specifications*

Item	Value
Process connections	40 pole screw terminal
Rated maximum continuous current per I/O channel	2.5 A
Rated maximum continuous current per process voltage connection (L1+, L2+)	L1+ max 8A L2+ max 8A
ModuleBus: Maximum 5 V current distribution: Maximum 24V current distribution:	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.5 - 2.5 mm <sup>2</sup> Stranded: 0.5 - 1.5 mm <sup>2</sup>
Mechanical keys (2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class II according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals



Table 114. TU818 Compact MTU Specifications (Continued)

Item	Value
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)

Connections

Table 115. Process Connector Pinning (X2)

Position	Row A	Row B	Row C	Row D
1	L1-	L1-	L1+	L1+
2	A1	B1	C1	D1
3	A2	B2	C2	D2
4	A3	B3	C3	D3
5	A4	B4	C4	D4
6	A5	B5	C5	D5
7	A6	B6	C6	D6
8	A7	B7	C7	D7
9	A8	B8	C8	D8
10	L2-	L2-	L2+	L2+

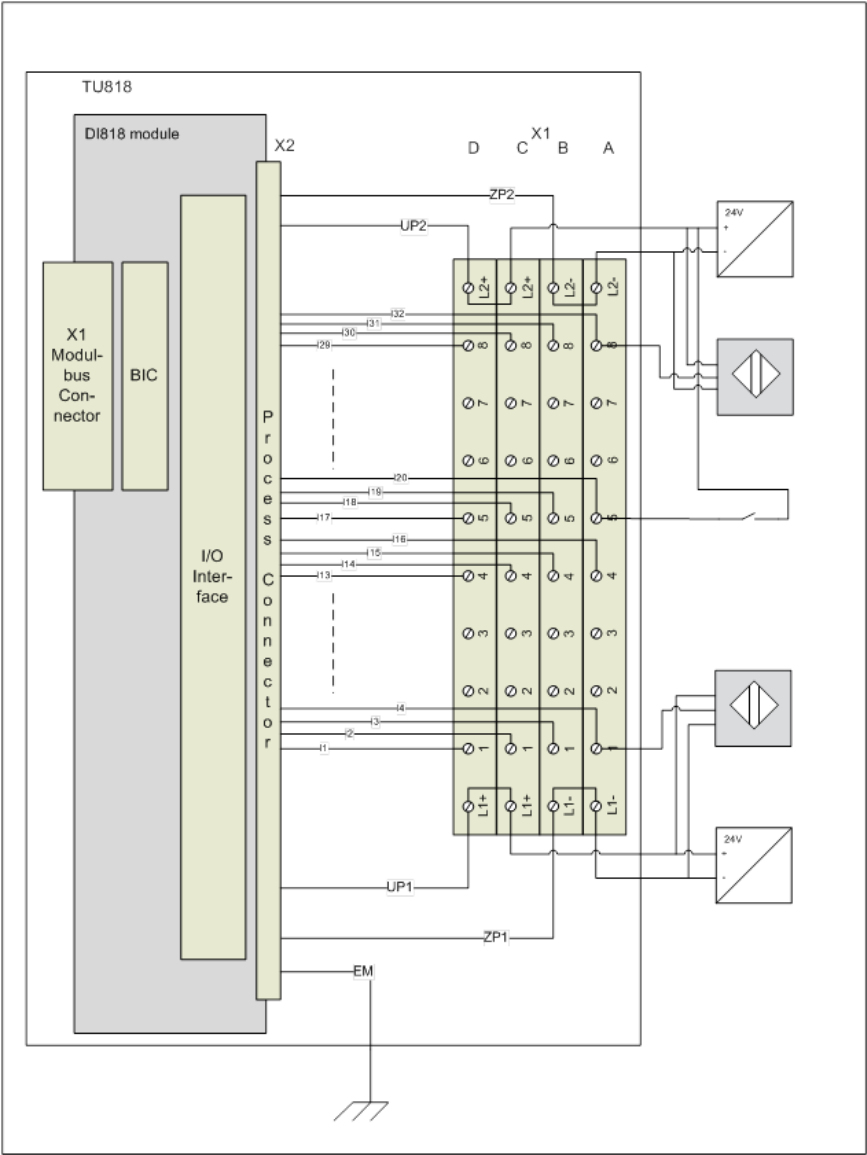


Figure 246. TU818 Process Connections

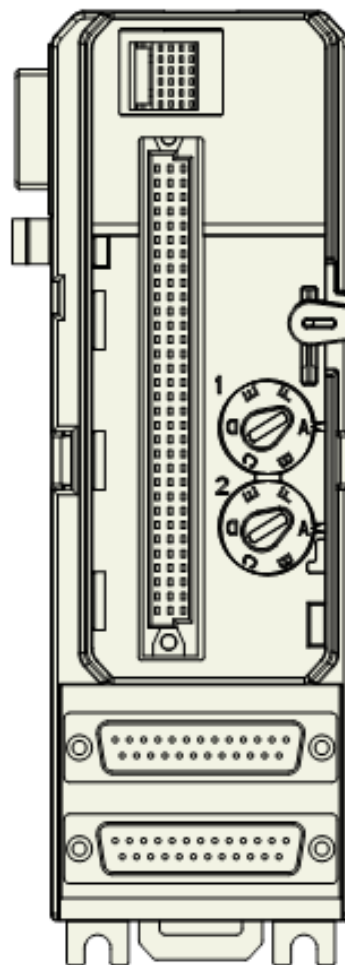
## TU819 Compact MTU

### Features

- 50 Volt applications - use with DI818 and DO818 I/O modules.
- Compact installation of I/O modules using D-sub 25 connector.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU819 is a 50 V compact module termination unit (MTU) for the S800 I/O system with 32 signal connections. The MTU is a passive unit used for connection of the field wiring. It also contains a part of the ModuleBus.



The TU819 MTU can have up to 32 I/O signals. The maximum rated voltage is 50 V and maximum rated current is 2.5 A per channel. The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal connector is a D-Sub 25 pin (male).

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

Technical Data

Table 116. TU819 Compact MTU Specifications

Item	Value
Process connections	Two D-sub connectors 25 pin (male) up to 32 I/O signals
Rated maximum continuous current per I/O channel	2.5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation

Table 116. TU819 Compact MTU Specifications (Continued)

Item	Value
Equipment class	Class II according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)
Rated max. continuous current per process voltage connection Up/Zp.	L1+ max 8A L2+ max 8A

Connections

Table 117. Process Connection D-sub 25 (X1A and X1B)

X1A		X1B	
Pin.	MTU Signal	Pin.	MTU Signal
1	UP1	1	UP2
14	UP1	14	UP2
2	ZP1	2	ZP2
15	ZP1	15	ZP2
3	S1	3	S17
16	S2	16	S18
4	S3	4	S19
17	S4	17	S20
5	S5	5	S21
18	S6	18	S22
6	S7	6	S23
19	S8	19	S24
7	S9	7	S25
20	S10	20	S26
8	S11	8	S27
21	S12	21	S28
9	S13	9	S29
22	S14	22	S30
10	S15	10	S31
23	S16	23	S32
11	UP1	11	UP2

Table 117. Process Connection D-sub 25 (X1A and X1B)

X1A		X1B	
Pin.	MTU Signal	Pin.	MTU Signal
24	UP1	24	UP2
12	ZP1	12	ZP2
25	ZP1	25	ZP2
13	EM	13	EM

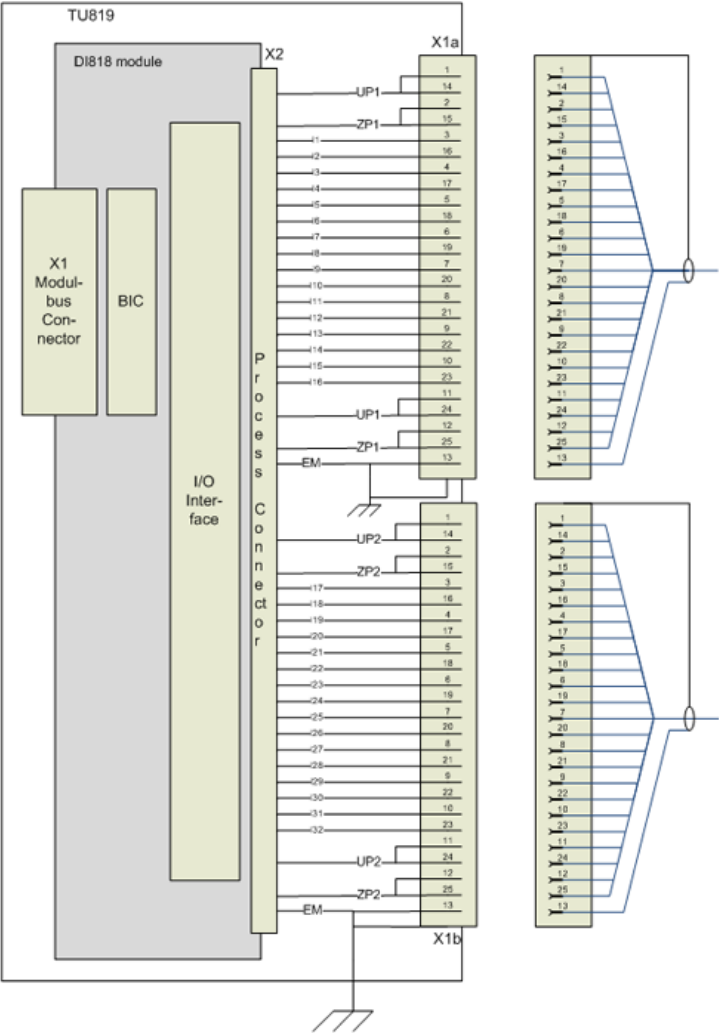


Figure 247. TU819 Block diagram and connection to Modulebus

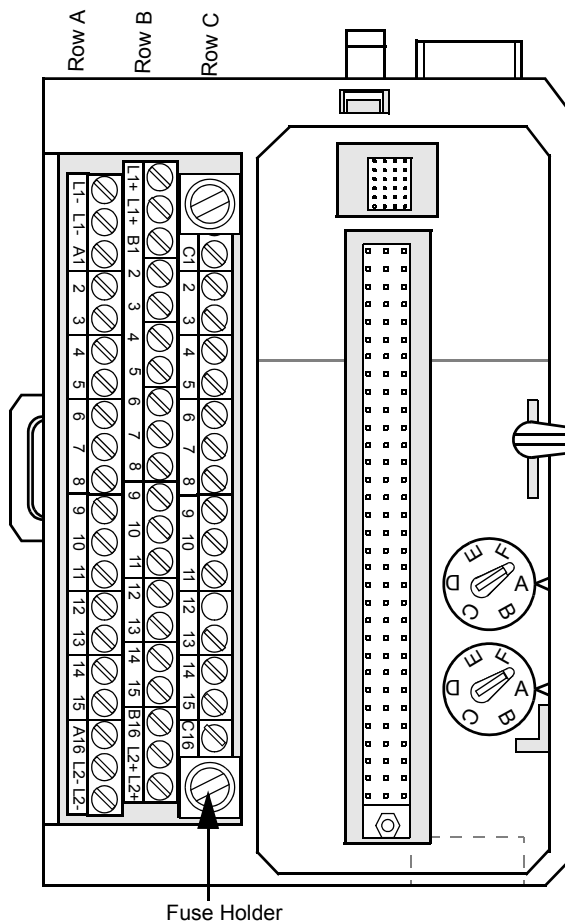




## TU830/TU830V1 Extended MTU

### Features

- 50 Volt applications - use with AI810, AI815, AI820, AI830, AI830A, AI835, AI835A, AI843, AI845, AO810, AO810V2, AO815, AO820, AO845, AO845A, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO815, DO840, DO880, DP820 and DP840 I/O modules.
- Complete installation of I/O modules using 3-wire connections, fuses and field power distribution.
- Up to 16 channels of field signals and process power connections.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



**Description**

The TU830/TU830V1 is a 16 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU830/TU830V1 MTU can have up to 16 I/O channels and two process voltage connections. Each channel has two I/O connections and one ZP connection.

The process voltage can be connected to two individually isolated groups. Each group has a 6.3 A fuse. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel. It is recommended that the fuse rating be chosen to meet the applications needs, see [Table 118](#).

*Table 118. Recommended fuse for TU830*

Module Type	Configuration <sup>(1)</sup>	Total current consumption at 24V process power supply (both groups UP1 and UP2)	Recommended fuse <sup>(2)</sup> per group (L1 and L2)
DO810	NA	Depends on load	Total load one group (8 ch) + 2A
DO814	NA	Depends on load	Total load one group (8 ch) + 2A
DO815	NA	Depends on load	Total load one group (4 ch) + 2A
DO818	NA	Depends on load	
DO840	NA	Depends on load	Total load one group (8 ch) + 2A
DO880	NA	Depends on load	Total load one group (8 ch) + 2A
DI810	2-wire connection	144 mA (9mA per ch @ 30V)	125mA
DI811	2-wire connection	96 mA (6mA per ch @ 60V)	80mA
DI814	2-wire connection	144 mA (9mA per ch @ 30V)	125mA

Table 118. Recommended fuse for TU830 (Continued)

Module Type	Configuration <sup>(1)</sup>	Total current consumption at 24V process power supply (both groups UP1 and UP2)	Recommended fuse <sup>(2)</sup> per group (L1 and L2)
DI818	2-wire connection		
DI830	2-wire connection	144 mA (9mA per ch @ 30V)	125mA
DI831	2-wire connection	100 mA (6.25mA per ch @ 30V)	80mA
DI840	2-wire connection	159 mA (internal + 9mA per ch @ 30V)	250mA (L1)
DI880	2-wire connection	175 mA (internal 10mA per ch @ 30V)	315mA (L1)
DI885	2-wire connection	32 mA (4mA per ch @ 30V)	63mA (L1 for 24 V, L2 for 48 V)
AO810/AO810V2	NA	245 mA	400mA (L1 or L2)
AO815	NA	218 mA	400mA (L1)
AO820	NA	(3)	NA
AO845/AO845A	NA	218 mA	400mA (L1)
AI810	2-wire connection	184 mA (23mA per ch)	160mA
AI815	2-wire connection	265 mA (22 + (23*1,32 per channel))	200mA
AI820	2-wire connection	92 mA (23mA per ch)	80mA
AI830/AI830A	2-wire connection	(3)	NA
AI835/AI835A	2-wire connection	(3)	NA
AI843	2-wire connection	(3)	NA
AI845	2-wire connection	265 mA (22 + (23*1,32 per channel))	200mA

Table 118. Recommended fuse for TU830 (Continued)

Module Type	Configuration <sup>(1)</sup>	Total current consumption at 24V process power supply (both groups UP1 and UP2)	Recommended fuse <sup>(2)</sup> per group (L1 and L2)
DP820	NA	Depends on load	Depends on load
DP840	2-wire connection, NAMUR	122 mA (internal + 8.2mA per ch @ 8.2V)	200 mA (L1)
DP840	2-wire connection, 12 V	124 mA (internal + 4.3mA per ch @ 12V)	200mA (L1)
DP840	2-wire connection, 24 V	145 mA (internal + 4mA per ch @ 24V)	250mA (L1)

(1) If 3-wire field devices are connected, the internal current consumption must be considered.

(2) Use fuse 5 x 20 mm, Time-Lag.

(3) Unit does not use process power supply.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 8 I/O channels, process voltage connection and a 6.3 A fuse (as delivered). Each I/O channel has two I/O connections and one ZP connection. For input modules, field power is provided by the B-row.

**Technical Data***Table 119. TU830/TU830V1 Extended MTU Specifications*

Item	Value
Process Connections	56 up to 16 I/O channels (2 terminals per channel) 4 Process power 6.3 A 10 x 2 Process power (0 V)
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (2)	6.3 A (slow glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed

Table 119. TU830/TU830V1 Extended MTU Specifications (Continued)

Item	Value
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.28 kg (0.6 lbs.)

Connections

Table 120. TU830/TU830V1 Process Connection Screw Terminals (X1)

Position <sup>(1)</sup>	Row A	Row B	Row C
1	L1-	L1+	NC
2	L1-	L1+	NC
3	A1	B1	C1
4	2	2	2
5	3	3	3
6	4	4	4
7	5	5	5
8	6	6	6
9	7	7	7
10	8	8	8
11	9	9	9
12	10	10	10
13	11	11	11
14	12	12	12
15	13	13	13

Table 120. TU830/TU830V1 Process Connection Screw Terminals (X1) (Continued)

Position <sup>(1)</sup>	Row A	Row B	Row C
16	14	14	14
17	15	15	15
18	A16	B16	C16
19	L2-	L2+	NC
20	L2-	L2+	NC

(1) All positions marked NC are not mounted in the connector.



## Block Diagram TU830/TU830V1

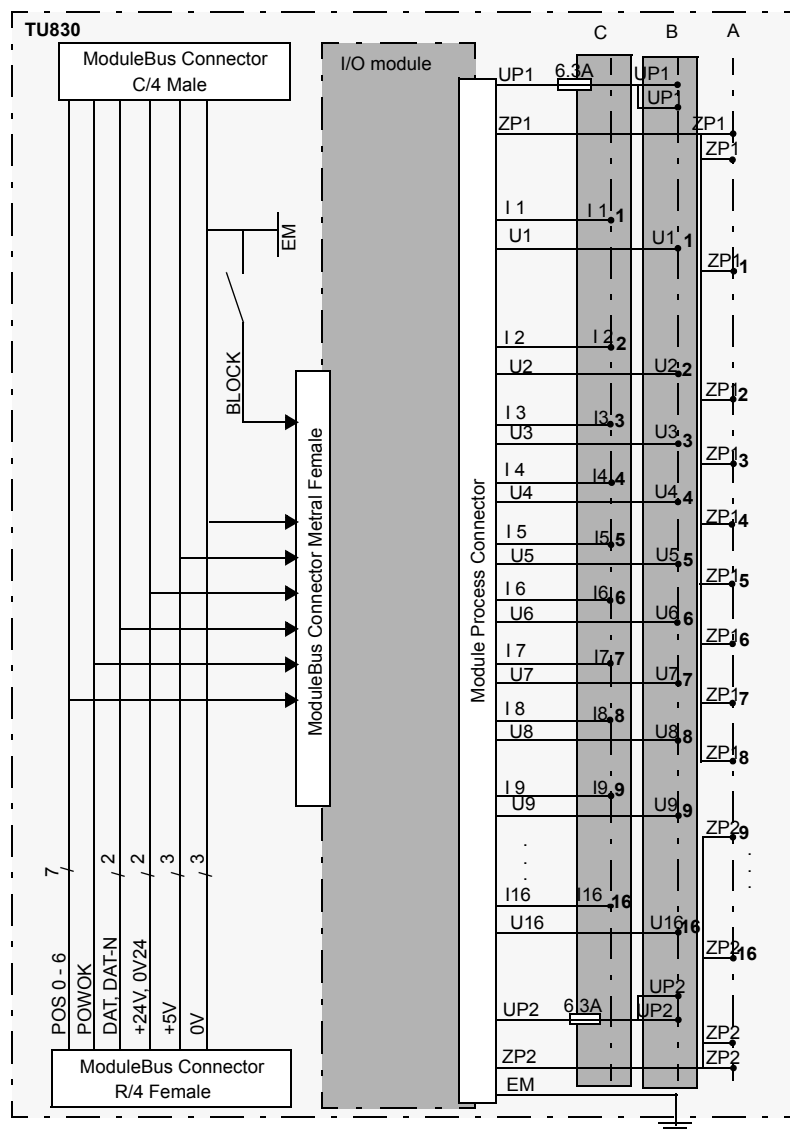


Figure 248. TU830/TU830V1 Block Diagram

## TU831/TU831V1 Extended MTU

### Features

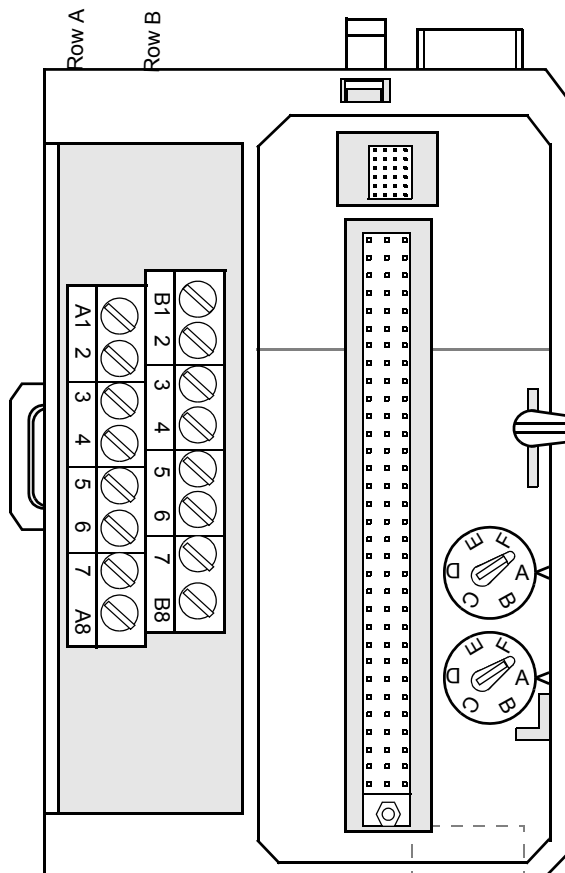
- 250 Volt applications - use with DI820, DI821, DO820, and DO821 I/O modules.
- Greater connection area for larger wires.
- Up to 8 isolated channels of field signals.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU831/TU831V1 is a 8 channel 250 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU831/TU831V1 MTU can have up to 8 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.



The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections.

### Technical Data

*Table 121. TU831/TU831V1 Compact MTU Specifications*

Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel)
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 6mm <sup>2</sup> Stranded: 0.2 - 4 mm <sup>2</sup> , 24 - 10 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2)	36 different combinations

Table 121. TU831/TU831V1 Compact MTU Specifications (Continued)

Item	Value
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.22 kg (0.48 lbs.)

Connections

Table 122. TU831/TU831V1 Process Connection Screw Terminals (X1)

Position	Row A	Row B
1	A1	B1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6

Table 122. TU831/TU831V1 Process Connection Screw Terminals (X1)

Position	Row A	Row B
7	7	7
8	A8	B8

Block Diagram TU831/TU831V1

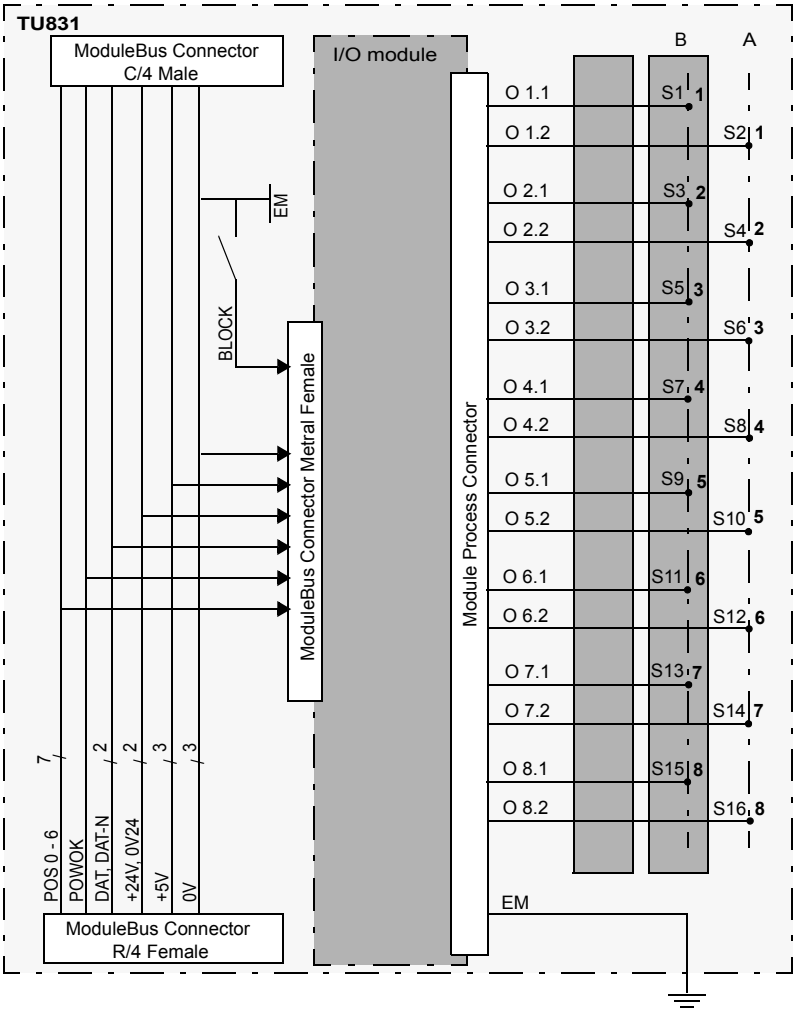
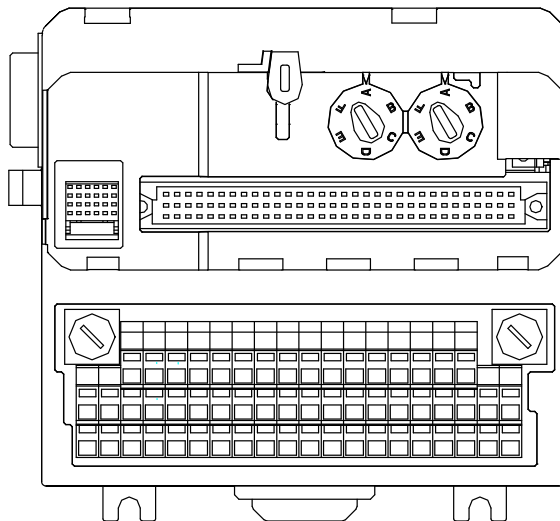


Figure 249. TU831/TU831V1 Block Diagram

## TU833 Extended MTU

### Features

- 50 Volt applications - use with AI810, AI815, AI820, AI830, AI830A, AI835, AI835A, AI843, AI845, AO810, AO810V2, AO815, AO820, AO845, AO845A, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO815, DO840, DO880, DP820 and DP840 I/O modules.
- Complete installation of I/O modules using 3-wire connections, fuses and field power distribution.
- Up to 16 channels of field signals and process power connections.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.
- Spring-case terminal.



### Description

The TU833 is a 16 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU833 MTU can have up to 16 I/O channels and two process voltage connections. Each channel has two I/O connections and one ZP connection. The process voltage can be connected to two individually isolated groups. Each group has a 6.3 A fuse. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel. It is recommended that the fuse rating be chosen to meet the applications needs, see S800 I/O Getting Started chapter Power and Cooling.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into two equal and individually isolated groups. Each group consists of 8 I/O channels, process voltage connection and a 6.3 A fuse (as delivered). Each I/O channel has two I/O connections and one ZP connection. For input modules, field power is provided by the B-row.

The process connection terminals are of spring-case type. Only one wire per terminal is recommended.



**Technical Data***Table 123. TU833 Extended MTU Specifications*

Item	Value
Process Connections	56 up to 16 I/O channels (2 terminals per channel) 4 Process power 6.3 A 10 x 2 Process power (0 V)
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (2)	6.3 A (slow glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Only one wire per terminal Stripping length: 6 mm
Mechanical keys (2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed

Table 123. TU833 Extended MTU Specifications (Continued)

Item	Value
Depth	64 mm (2.52") including terminals
Height	105 mm (4.1")
Weight	0.28 kg (0.6 lbs.)

Connections

Table 124. TU833 Process Connection Screw Terminals (X1)

Position <sup>(1)</sup>	Row A	Row B	Row C
1	L1-	L1+	NC
2	L1-	L1+	NC
3	A1	B1	C1
4	2	2	2
5	3	3	3
6	4	4	4
7	5	5	5
8	6	6	6
9	7	7	7
10	8	8	8
11	9	9	9
12	10	10	10
13	11	11	11
14	12	12	12
15	13	13	13

Table 124. TU833 Process Connection Screw Terminals (X1) (Continued)

Position <sup>(1)</sup>	Row A	Row B	Row C
16	14	14	14
17	15	15	15
18	A16	B16	C16
19	L2-	L2+	NC
20	L2-	L2+	NC

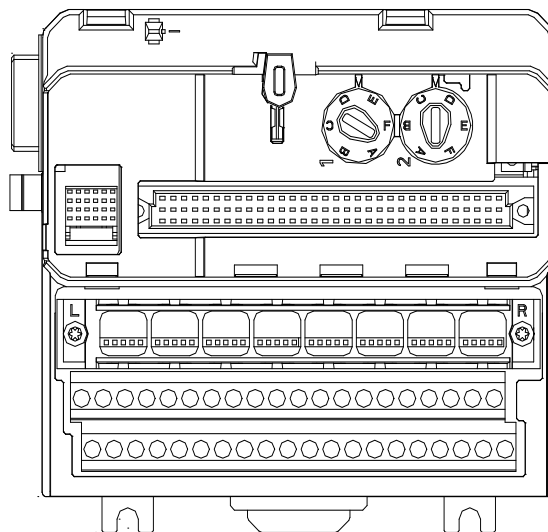
(1) All positions marked NC are not mounted in the connector.



## TU834 Extended MTU

### Features

- 50 Volt applications - use with AI880 and AI880A modules.
- Complete installation of I/O modules using 2-wire connections and field power distribution.
- Up to 8 channels of field signals and process power connections.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.
- Include 8 individual shunt sticks.



### Description

The TU834 is a 8 channel module termination unit (MTU) for single S800 I/O modules and for mounting on a vertical or horizontal DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU834 MTU can have up to 8 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. Input signals are connected via individual shunt sticks, TY801. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel.

The MTU distributes the ModuleBus to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Technical Data

Table 125. TU834 Extended MTU Specifications

Item	Value
Process Connections	40 up to 8 I/O channels (2 terminals per channel) 4 Process power 20 Process power (0 V)
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A

Table 125. TU834 Extended MTU Specifications (Continued)

Item	Value
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	126 mm (5.0") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3") including locking device
Weight	0.28 kg (0.6 lbs.)

**Connections**

Table 126. TU834 Process Connection Screw Terminals (X1)

Position	Row A	Row B
1	L1-	L1+
2	L1-	L1+
3	A1	B1
4	2	2
5	3	3

Table 126. TU834 Process Connection Screw Terminals (X1) (Continued)

Position	Row A	Row B
6	4	4
7	5	5
8	6	6
9	7	7
10	8	8
11	9	9
12	10	10
13	11	11
14	12	12
15	13	13
16	14	14
17	15	15
18	A16	B16
19	L2-	L2+
20	L2-	L2+



Block Diagram TU834

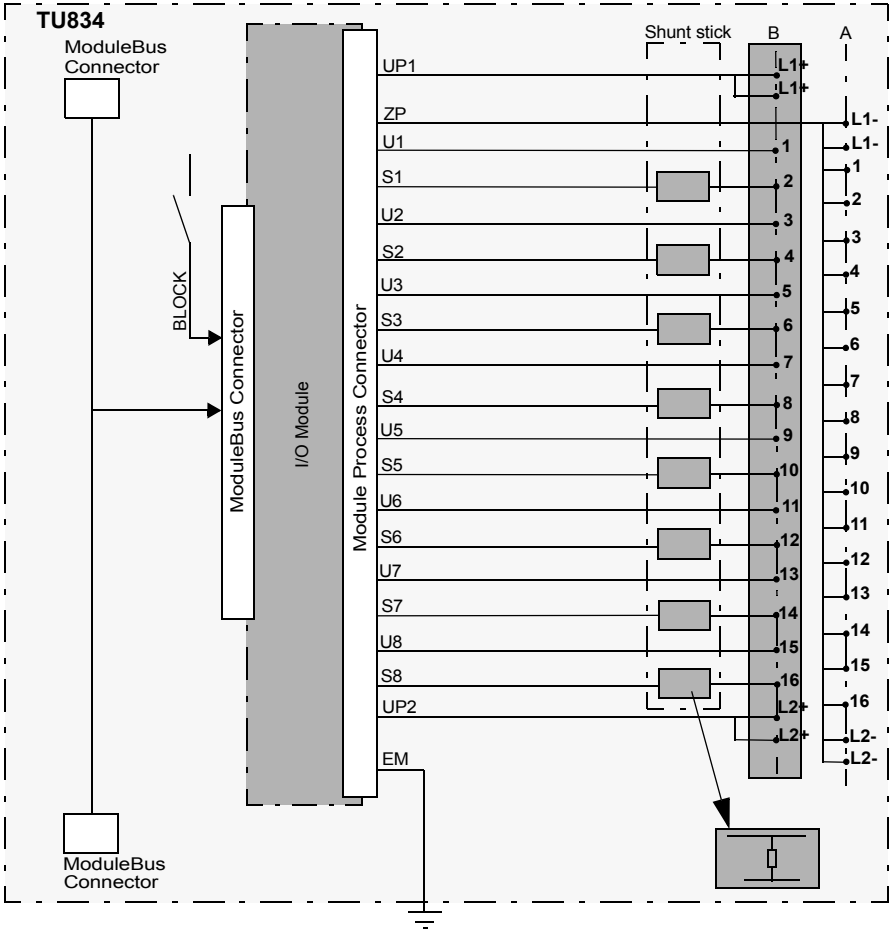
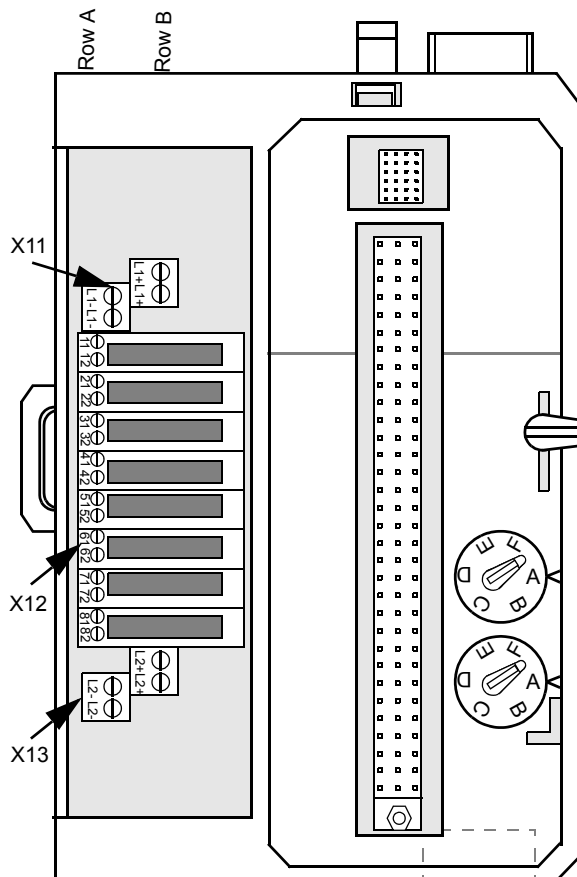


Figure 251. TU834 Block Diagram

## TU835/TU835V1 Extended MTU

### Features

- 50 Volt applications - use with the AI810, AI815 and AI845 modules.
- Up to 8 channels of field signals and process power connections.
- Each channel has one fused transducer power terminal and one signal connection.
- Process voltage can be connected to 2 individually isolated groups.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU835/TU835V1 is a 8 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU835/TU835V1 MTU can have up to 8 I/O channels. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections: one fused transducer power terminal and one signal connection. Process voltage can be connected to two individually isolated groups.

**Technical Data***Table 127. TU835/TU835V1 Compact MTU Specifications*

Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel) 4 Process power 4 Process power (0V)
Rated maximum continuous current per I/O channel	2 A
ModuleBus: Maximum 5 current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (8)	100 mA (fast glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")

*Table 127. TU835/TU835V1 Compact MTU Specifications (Continued)*

Item	Value
Weight	0.26 kg (0.57 lbs.)
Rated max. continuous current per process voltage connection Up/Zp.	8 A

**Connections***Table 128. TU835/TU835V1 Process Power Source Connections (X11, X13)*

Position	Row A	Row B
X11 - 1	L1-	L1+
X11 - 2	L1-	L1+
X13 - 1	L2-	L2+
X13 - 2	L2-	L2+

*Table 129. TU835/TU835V1 Process Connection Screw Terminals (X12)*

Position	Row A
1	11 (F1, L1+ power)
2	12 (signal)
3	21 (F2, L1+ power)
4	22 (signal)
5	31 (F3, L1+ power)
6	32 (signal)
7	41 (F4, L1+ power)
8	42 (signal)

Table 129. TU835/TU835V1 Process Connection Screw Terminals (X12)

Position	Row A
9	51 (F5, L2+ power)
10	52 (signal)
11	61 (F6, L2+ power)
12	62 (signal)
13	71 (F7, L2+ power)
14	72 (signal)
15	81 (F8, L2+ power)
16	82 (signal)

Block Diagram TU835/TU835V1

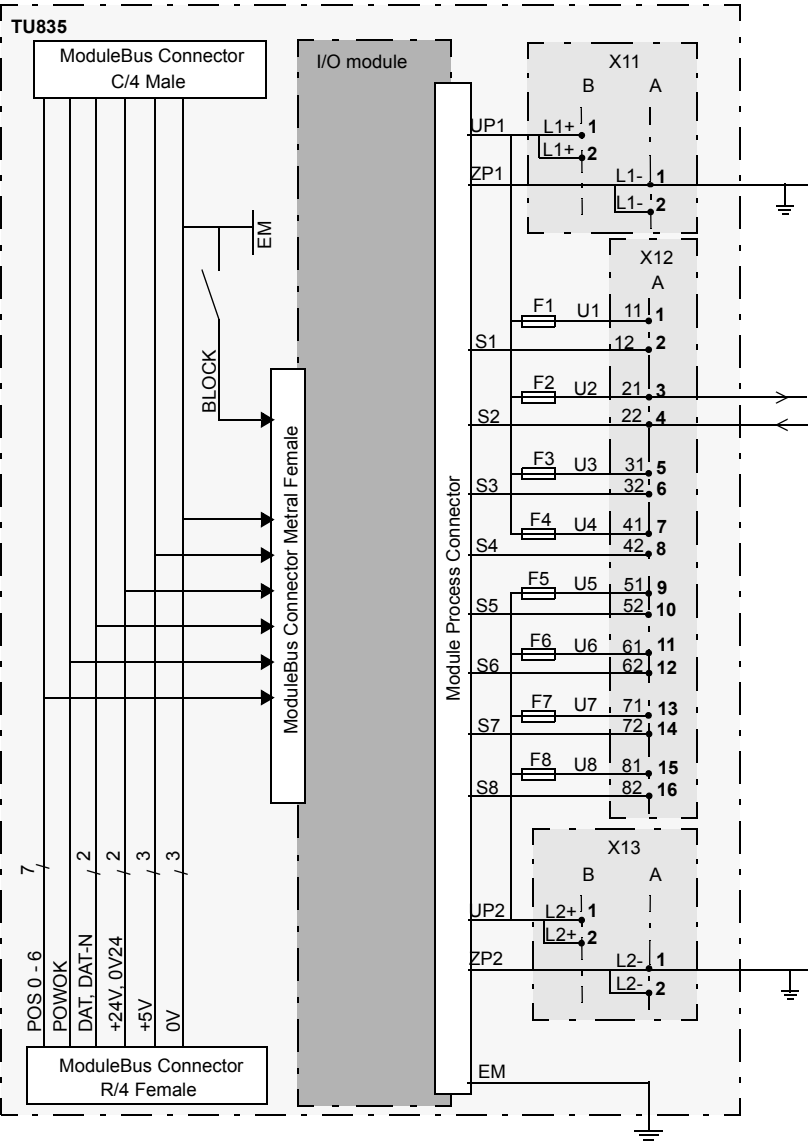
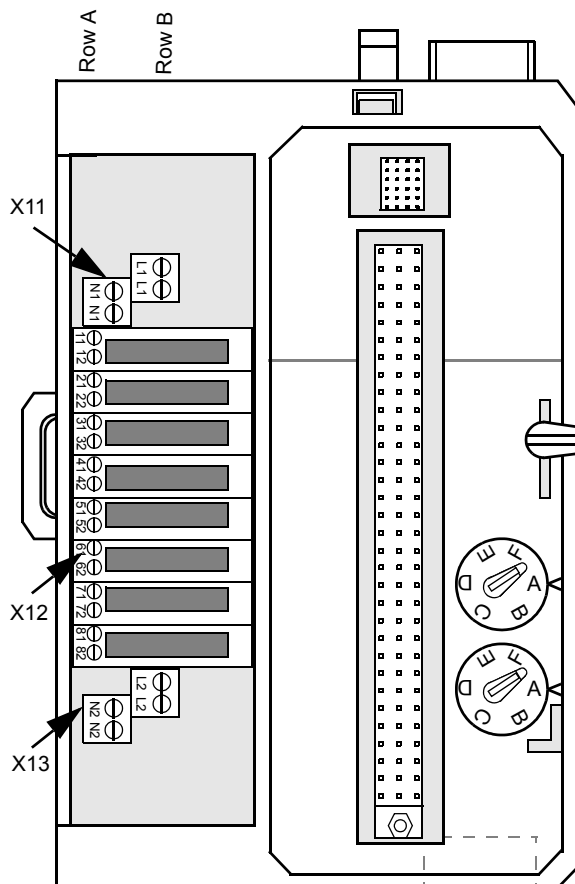


Figure 252. TU835/TU835V1 Block Diagram

## TU836/TU836V1 Extended MTU

### Features

- 250 Volt applications - use with the DO820, and DO821 modules.
- Two groups with 4 channels of field signals and process power connections.
- Each channel has one fused load power terminal and one signal return connection.
- Process voltage can be connected to 2 individually isolated groups.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU836/TU836V1 is a 8 channel 250 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU836/TU836V1 MTU can have up to 8 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel.



The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into two equal and individually isolated groups. Each group consists of 4 I/O connections and process voltage connection. Each channel has two connections: one fused load outlet terminal and one signal return connection.

**Technical Data***Table 130. TU836/TU836V1 Extended MTU Specifications*

Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel) 4 Process power 4 Process power (0V)
Rated maximum continuous current per process voltage connection (L1, L2, N1, N2)	10 A
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (8)	3.15 A (fast glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed

*Table 130. TU836/TU836V1 Extended MTU Specifications (Continued)*

Item	Value
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.26 kg (0.57 lbs.)

**Connections***Table 131. TU836/TU836V1 Process Power Source Connections (X11, X13)*

Position	Row A	Row B
X11 - 1	N1	L1
X11 - 2	N1	L1
X13 - 1	N2	L2
X13 - 2	N2	L2

*Table 132. TU836/TU836V1 Process Connection Screw Terminals (X12)*

Position	Row A
1	11 (F1, L1 power)
2	12 (signal return)
3	21 (F2, L1 power)
4	22 (signal return)
5	31 (F3, L1 power)
6	32 (signal return)
7	41 (F4, L1 power)

Table 132. TU836/TU836V1 Process Connection Screw Terminals (X12) (Continued)

Position	Row A
8	42 (signal return)
9	51 (F5, L2 power)
10	52 (signal return)
11	61 (F6, L2 power)
12	62 (signal return)
13	71 (F7, L2 power)
14	72 (signal return)
15	81 (F8, L2 power)
16	82 (signal return)

Block Diagram TU836/TU836V1

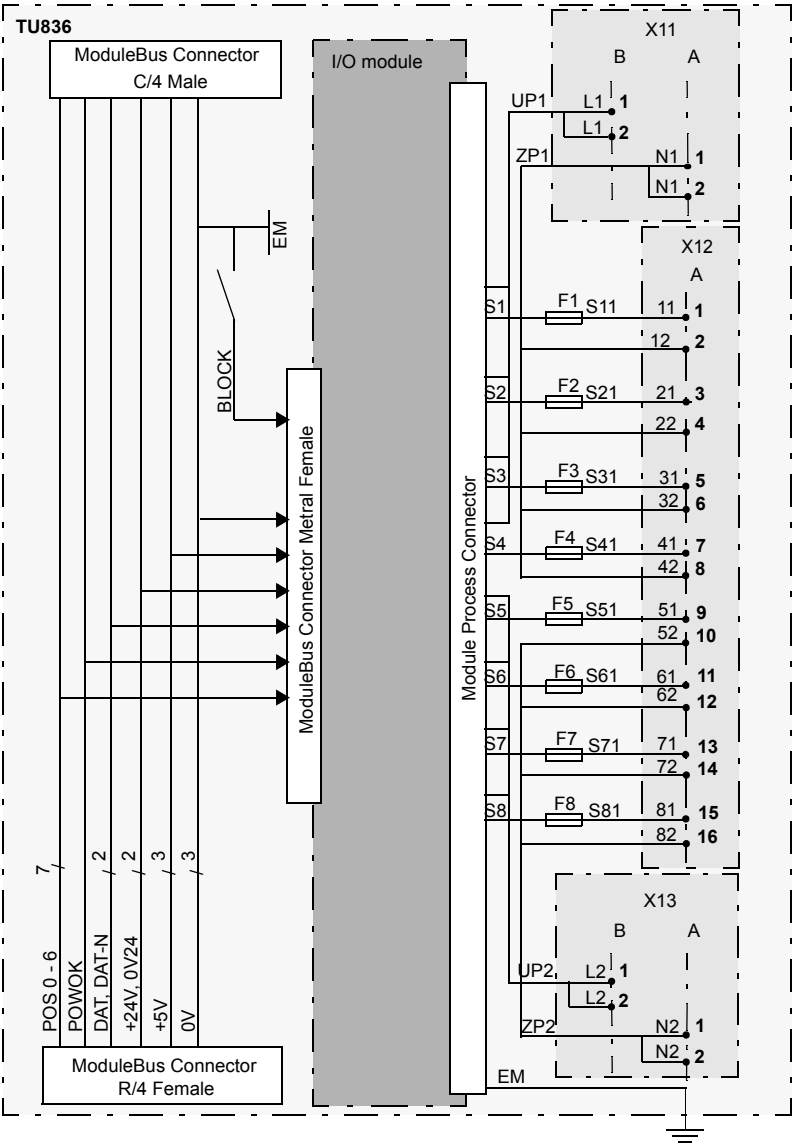
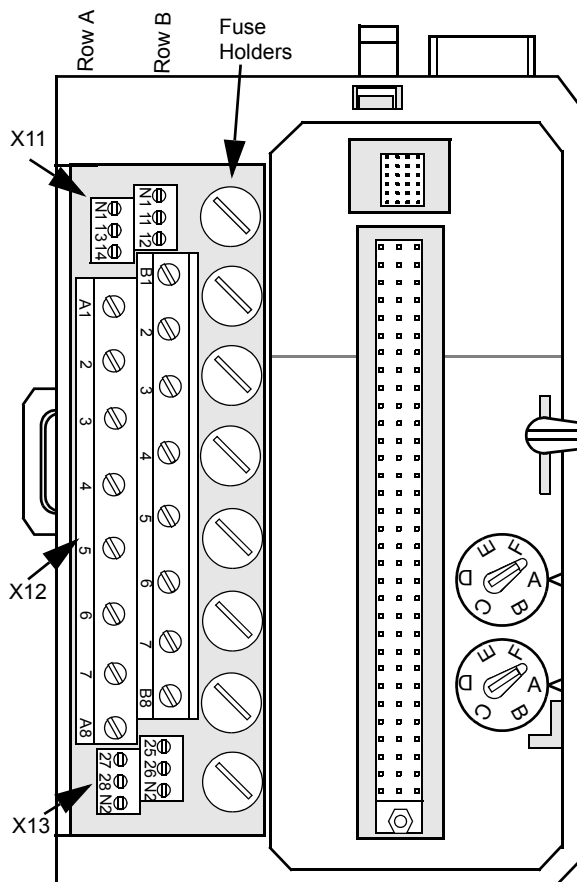


Figure 253. TU836/TU836V1 Block Diagram

## TU837/TU837V1 Extended MTU

### Features

- 250 Volt applications - use with the DO820, and DO821 modules.
- Up to 8 individually isolated channels of field signals and process power connections.
- Each channel has two terminals and one is fused.
- Allows a mix of isolated and grouped channels.
- Process voltage return can be connected to two individually isolated groups.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU837/TU837V1 is a 8 channel 250 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU837/TU837V1 MTU can have up to 8 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections, one is fused. There are 2 individually isolated groups for signal return connections.

**Technical Data***Table 133. TU837/TU837V1 Extended MTU Specifications*

Item	Value
Process connections	28 up to 8 I/O channels (2 terminals per channel) 2 x 6 power common terminals
Rated maximum continuous current per signal return connection (N1, N2)	10 A
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution: Maximum 24 V current distribution:	1.5 A 1.5 A
Fuse (8)	3.15 A (fast glass tube, 5x20 mm)
Acceptable wire sizes Signal connection  Return connection	Solid: 0.2 - 6 mm <sup>2</sup> Stranded: 0.2 - 4 mm <sup>2</sup> , 24 - 10 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 8 mm  Solid: 0.2 - 4 mm Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V



Table 133. TU837/TU837V1 Extended MTU Specifications (Continued)

Item	Value
Dielectric test voltage	2000 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.26 kg (0.57 lbs.)

**Connections**

Table 134. TU837/TU837V1 Process Power Connection X11

Terminal	Row A		Row B	
	Signal	Marking	Signal	Marking
1	ZP1	N1	ZP1	N1
2	ZP1	13	ZP1	11
3	ZP1	14	ZP1	12

Table 135. TU837/TU837V1 Process Power Connection X13

Terminal	Row A		Row B	
	Signal	Marking	Signal	Marking
1	ZP2	27	ZP2	25
2	ZP2	28	ZP2	26
3	ZP2	N2	ZP2	N2

Table 136. TU837/TU837V1 Process Connection Terminals X12

Terminal	Row A		Row B	
	Signal	Marking	Signal	Marking
1	S21 (F1)	A1	S1	B1
2	S41 (F2)	2	S3	2
3	S61 (F3)	3	S5	3
4	S81 (F4)	4	S7	4
5	S101 (F5)	5	S9	5
6	S121 (F6)	6	S11	6
7	S141 (F7)	7	S13	7
8	S161 (F8)	A8	S15	B8

Block Diagram TU837/TU837V1

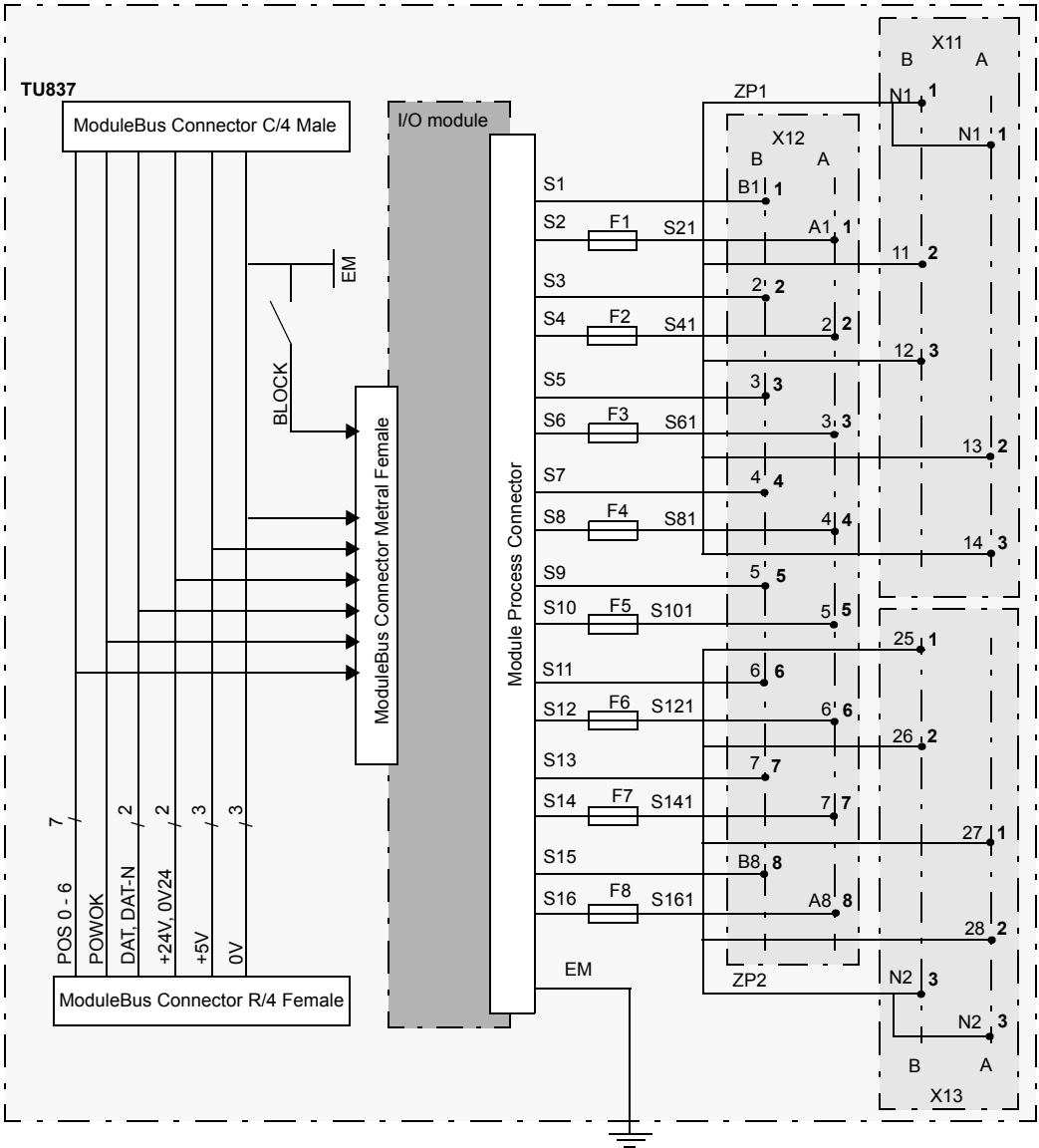
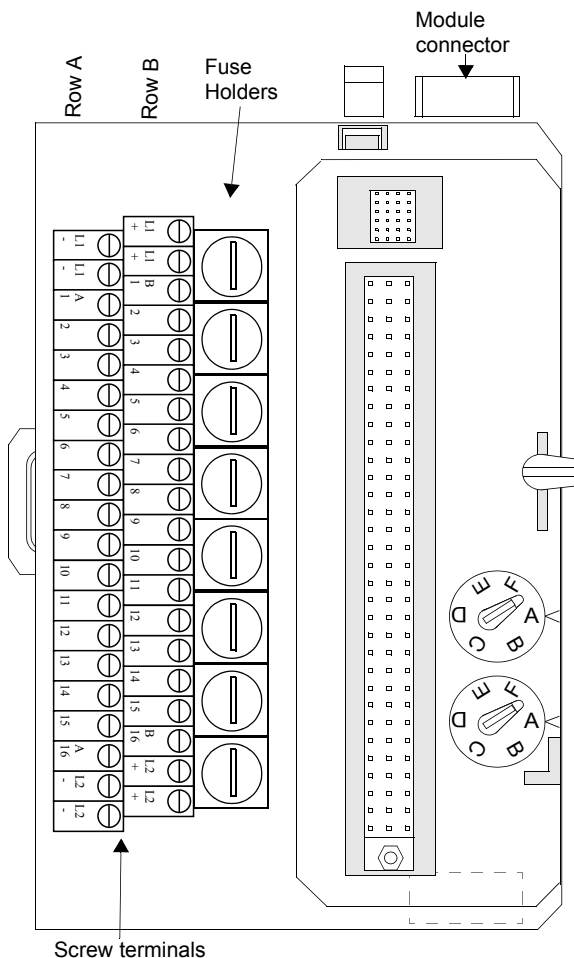


Figure 254. TU837/TU837V1 Block Diagram

## TU838 Extended MTU

### Features

- 50 Volt applications - use with the AI810, AI815, AI845, DI810, DI811, DI814, DI830, DI831, DI840 and DO814 modules.
- Complete installation of I/O modules using 3-wire connections, fuses and field power distribution.
- Up to 16 channels of field signals and 8 process power connections.
- Two channels share one fused transducer power terminal.
- Process voltage can be connected to 2 individually isolated groups, if the I/O module supports it.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



**Description**

The TU838 is a 16 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU838 MTU can have up to 16 I/O channels. The maximum rated voltage is 50 V and maximum rated current is 3 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into two equal and individually isolated groups. Each group consists of 8 I/O channels, four fused transducer power outlets, four return connections and process voltage connection. Process voltage can be connected to two individually isolated groups, only valid if the I/O module supports that.

**Technical Data***Table 137. TU838 Extended MTU Specifications*

Item	Value
Process connections	40 up to 16 I/O channels 8 fused sensor power outlets 4 Process power 12 Process power (0 V)
Rated maximum continuous current per process voltage connection	10 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Rated max. continuous current per channel	3 A
Fuse (8)	Only on delivery: 100 mA (fast glass tube, 5x20 mm) Otherwise: Max. 3,5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

Table 137. TU838 Extended MTU Specifications (Continued)

Item	Value
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.26 kg (0.57 lbs.)

**Connections**

Table 138. TU838 Process Connection Screw Terminals (X1)

Row A	Row B
L1- (L1- power)	L1+ (L1+ power)
L1- (L1- power)	L1+ (L1+ power)
A1 (F1, L1+)	B1 (signal)
A2 (L1-)	B2 (signal)
A3 (F2, L1+)	B3 (signal)
A4 (L1-)	B4 (signal)
A5 (F3, L1+)	B5 (signal)
A6 (L1-)	B6 (signal)
A7 (F4, L1+)	B7 (signal)
A8 (L1-)	B8 (signal)
A9 (F5, L2+)	B9 (signal)
A10 (L2-)	B10 (signal)
A11 (F6, L2+)	B11 (signal)

Table 138. TU838 Process Connection Screw Terminals (XI) (Continued)

Row A	Row B
A12 (L2-)	B12 (signal)
A13 (F7, L2+)	B13 (signal)
A14 (L2-)	B14 (signal)
A15 (F8, L2+)	B15 (signal)
A16 (L2-)	B15 (signal)
L2- (L2- power)	L2+ (L2+ power)
L2- (L2- power)	L2+ (L2+ power)



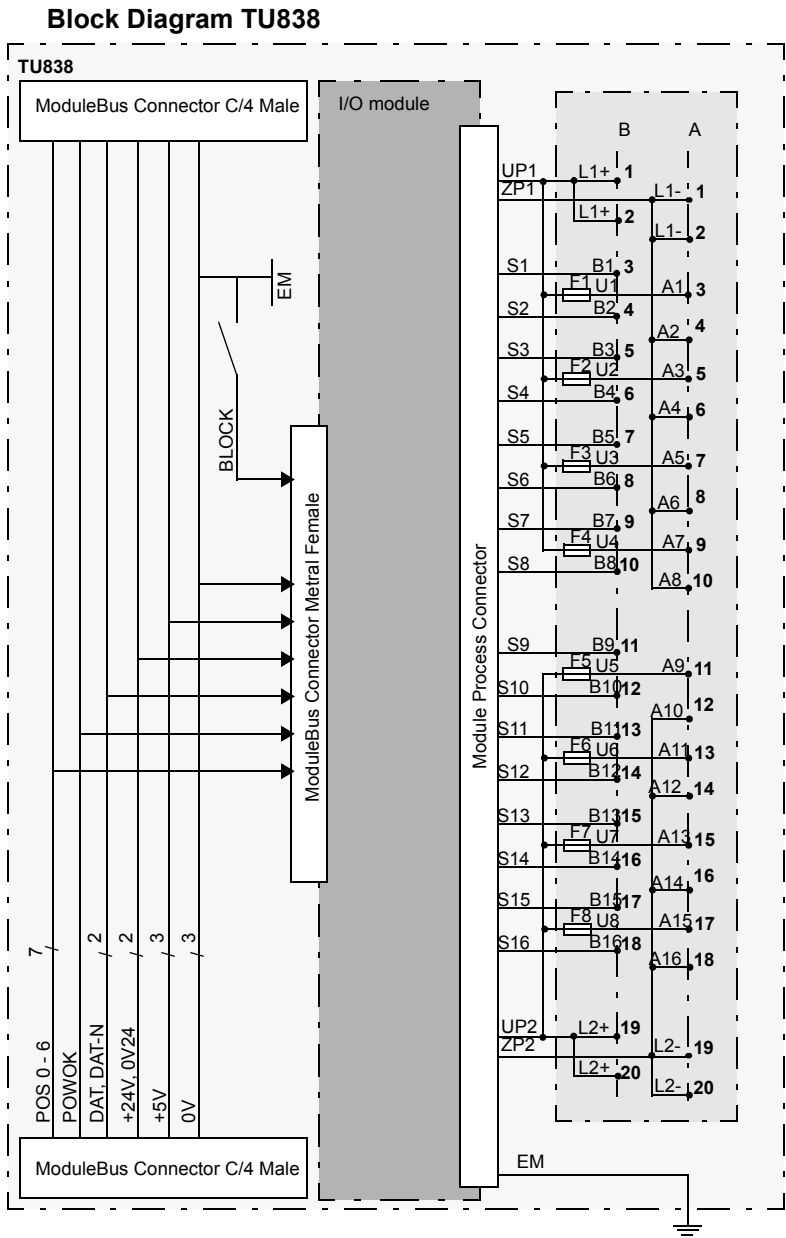


Figure 255. TU838 Block Diagram

## TU839 Extended MTU

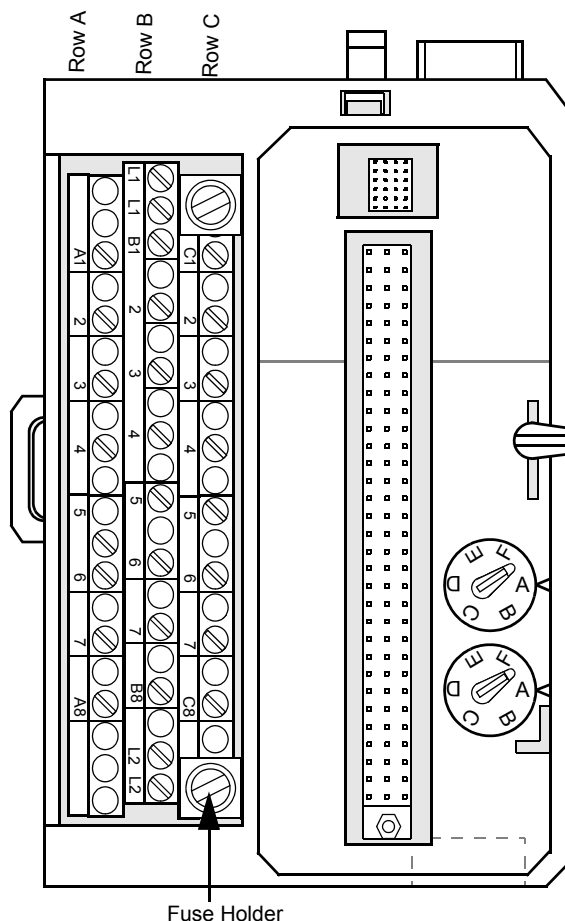
### Features

- 250 Volt applications- use with DI820, DI821 and DI825 I/O modules.
- 8 individually isolated I/O channels.
- Two individually isolated, fused groups for sensor power distribution.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.

### Description

The TU839 is a 8 channel 250 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU839 MTU can have up to 8 I/O channels and two groups of connections for sensor power distribution. Each channel has two I/O connections. The process voltage can be connected to two individually isolated groups for sensor power distribution. Each group has a 200 mA fuse. The maximum rated voltage is 250 V



and maximum rated current is 1 A per channel. It is recommended that the fuse rating be chosen to meet the applications needs.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

**Technical Data***Table 139. TU839 Extended MTU Specifications*

Item	Value
Process Connections	28 up to 8 I/O channels (2 terminals per channel) 2x6 Process Power terminals 0.2 A
Rated maximum continuous current per I/O channel	1 A
Rated maximum continuous current per process voltage connection (L)	10 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (2)	200 mA (slow glass tube, 5x20 mm)
Acceptable wire sizes	Stranded: 24-14 AWG 0.2-2,5 mm <sup>2</sup> (solid and stranded) Recommended torque 0.5 Nm.
Mechanical keys (2)	36 different combinations.
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2300 V a.c. channel to ground 1350 V a.c. channel to channel
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed.

Table 139. TU839 Extended MTU Specifications (Continued)

Item	Value
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.28 kg (0.6 lbs.)

**Connections**

Table 140. TU839 Process connection screw terminals (X1)

	Row A		Row B		Row C	
Position <sup>(1)</sup>	Signal	Marking	Signal	Marking	Signal	Marking
1	NC		UP1	L1		
2	NC		UP1	L1		
3	S2	A1	U1	B1	S1	C1
4	NC		NC		NC	
5	S4	2	U1	2	S3	2
6	NC		NC		NC	
7	S6	3	U1	3	S5	3
8	NC		NC		NC	
9	S8	4	U1	4	S7	4
10	NC		NC		NC	
11	S10	5	U2	5	S9	5
12	NC		NC		NC	
13	S12	6	U2	6	S11	6
14	NC		NC		NC	

Table 140. TU839 Process connection screw terminals (X1) (Continued)

	Row A		Row B		Row C	
Position <sup>(1)</sup>	Signal	Marking	Signal	Marking	Signal	Marking
15	S14	7	U2	7	S13	7
16	NC		NC		NC	
17	S16	A8	U2	B8	S15	C8
18	NC		NC		NC	
19	NC		UP2	L2		
20	NC		UP2	L2		

(1) All positions marked NC are not mounted in the connector.

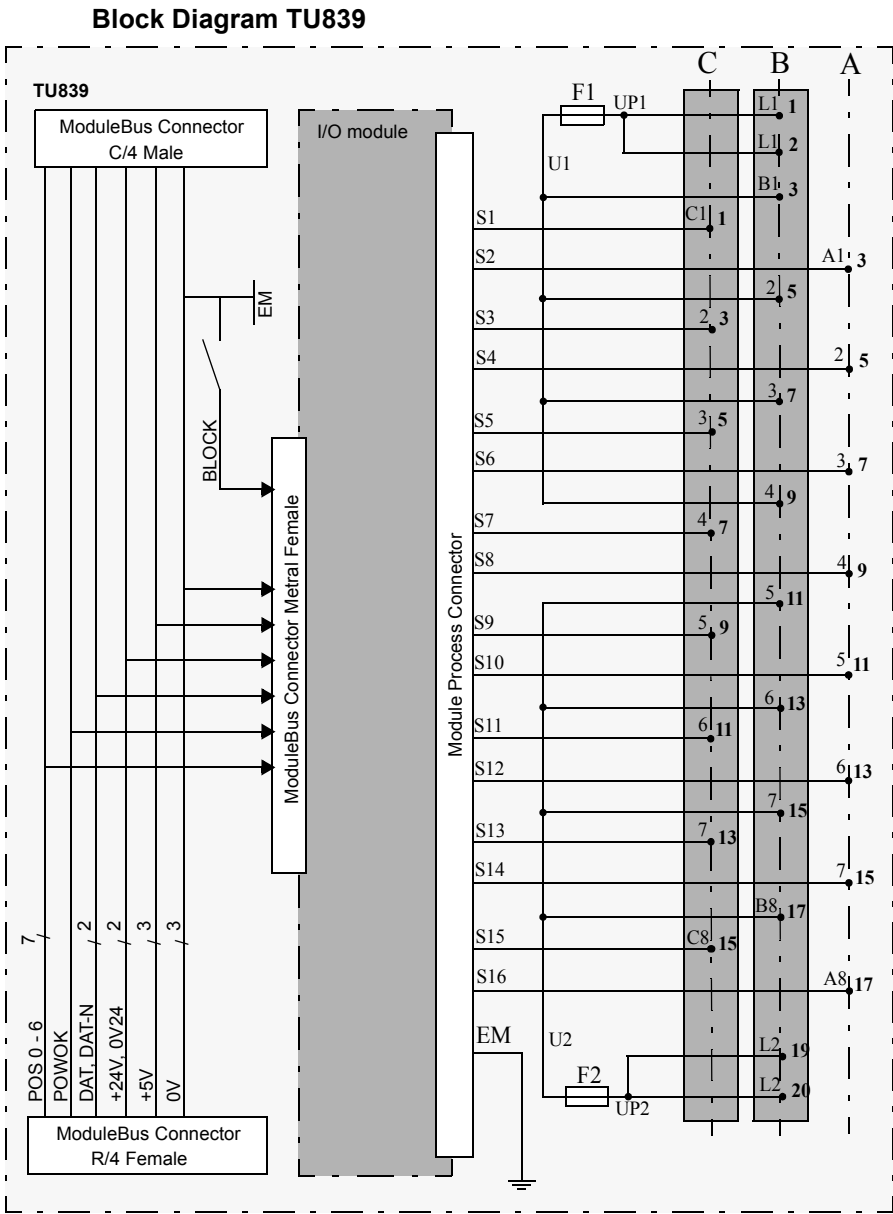
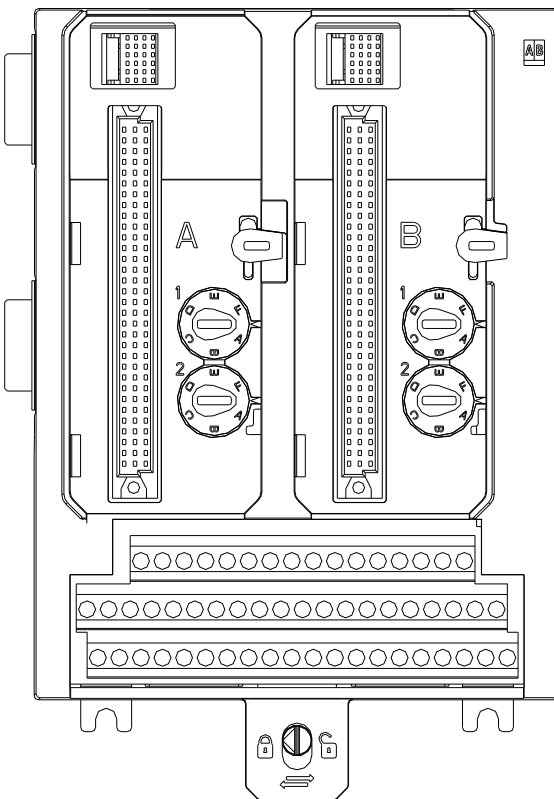


Figure 256. Block Diagram of TU839

## TU842 Redundant Horizontal MTU

### Features

- 50 Volt applications - use with AI843, AO845, AO845A, DI840, DI880, DO840, DO880 and DP840 I/O modules.
- Complete installation of I/O modules using 3-wire connections and field power distribution.
- Up to 16 channels of field signals and process power connections.
- Connections to two ModuleBuses and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU842 is a 16 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a horizontal DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.



The TU842 MTU can have up to 16 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. The maximum rated voltage is 50 V and maximum rated current is 3 A per channel.

The MTU distributes the two ModuleBuses to each I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each I/O module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations.

The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Each I/O channel has two I/O connections and one ZP connection. For input modules, field power is provided by the B-row.

### Technical Data

*Table 141. TU842 Redundant Horizontal MTU Specifications*

Item	Value
Process Connections	56 up to 16 I/O channels (2 terminals per channel) 4 Process power 20 Process power (0 V)
Rated maximum continuous current per I/O channel	3 A

Table 141. TU842 Redundant Horizontal MTU Specifications (Continued)

Item	Value
Rated maximum continuous current per process voltage connection (L+)	10 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	186.5 mm (7.34") including locking device
Weight	0.6 kg (1.3 lbs.)

## Connections

Table 142. TU842 Process Connection Screw Terminals (X1)

Position	Row A	Row B	Row C
1	L1-	L1+	
2	L1-	L1+	
3	A1	B1	C1
4	2	2	2
5	3	3	3
6	4	4	4
7	5	5	5
8	6	6	6
9	7	7	7
10	8	8	8
11	9	9	9
12	10	10	10
13	11	11	11
14	12	12	12
15	13	13	13
16	14	14	14
17	15	15	15
18	A16	B16	C16
19	L2-	L2+	
20	L2-	L2+	

Block Diagram TU842

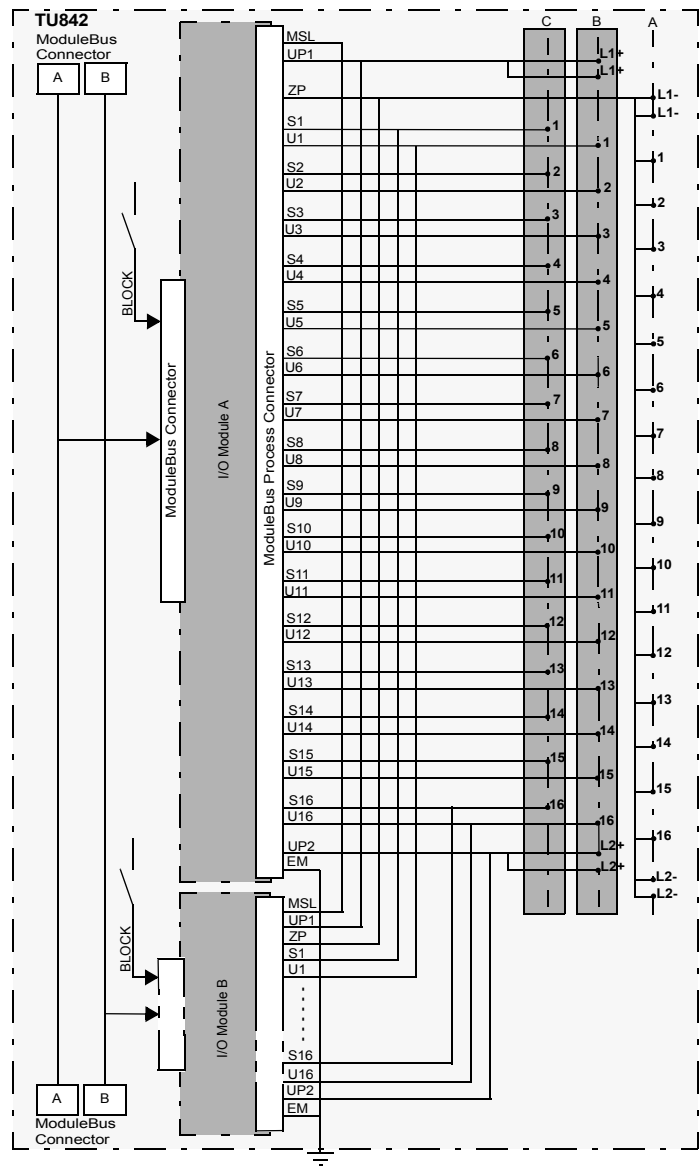
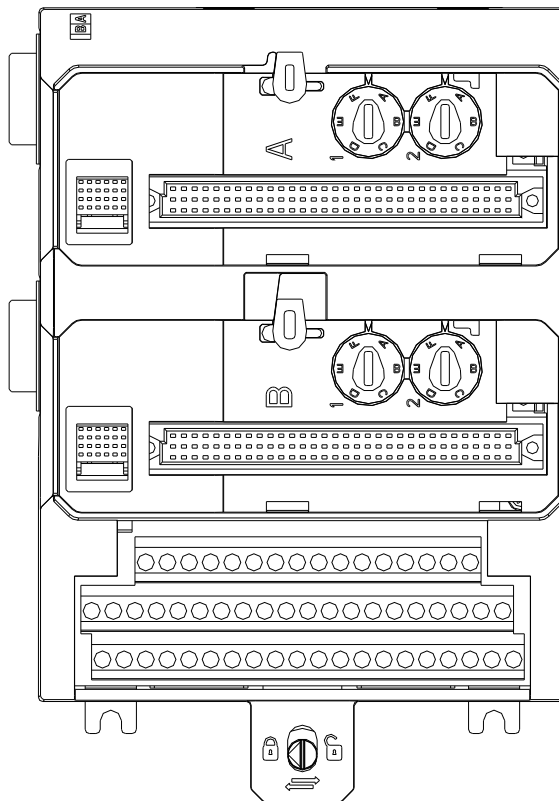


Figure 257. Block Diagram TU842

## TU843 Redundant Vertical MTU

### Features

- 50 Volt applications - use with AI843, AO845, AO845A, DI840, DI880, DO840, DO880 and DP840 I/O modules.
- Complete installation of I/O modules using 3-wire connections and field power distribution.
- Up to 16 channels of field signals and process power connections.
- Connections to two ModuleBuses and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU843 is a 16 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a vertical DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU843 MTU can have up to 16 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. The maximum rated voltage is 50 V and maximum rated current is 3 A per channel.

The MTU distributes the two ModuleBuses, one to each the I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Each I/O channel has two I/O connections and one ZP connection. For input modules, field power is provided by the B-row.

Technical Data

Table 143. TU843 Redundant Vertical MTU Specifications

Item	Value
Process Connections	56 up to 16 I/O channels (2 terminals per channel) 4 Process power 20 Process power (0 V)
Rated maximum continuous current per I/O channel	3 A

Table 143. TU843 Redundant Vertical MTU Specifications (Continued)

Item	Value
Rated maximum continuous current per process voltage connection (L+)	10 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	186.5 mm (7.34") including locking device
Weight	0.6 kg (1.3 lbs.)

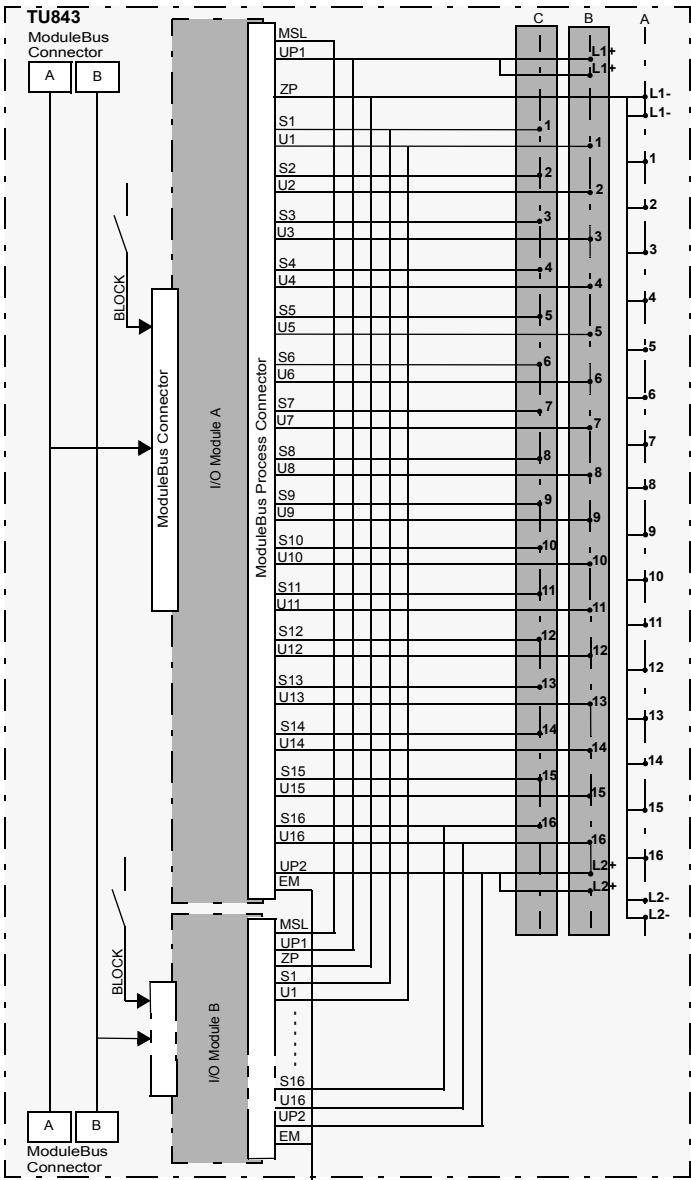
## Connections

*Table 144. TU843 Process Connection Screw Terminals (X1)*

Position	Row A	Row B	Row C
1	L1-	L1+	
2	L1-	L1+	
3	A1	B1	C1
4	2	2	2
5	3	3	3
6	4	4	4
7	5	5	5
8	6	6	6
9	7	7	7
10	8	8	8
11	9	9	9
12	10	10	10
13	11	11	11
14	12	12	12
15	13	13	13
16	14	14	14
17	15	15	15
18	A16	B16	C16
19	L2-	L2+	
20	L2-	L2+	



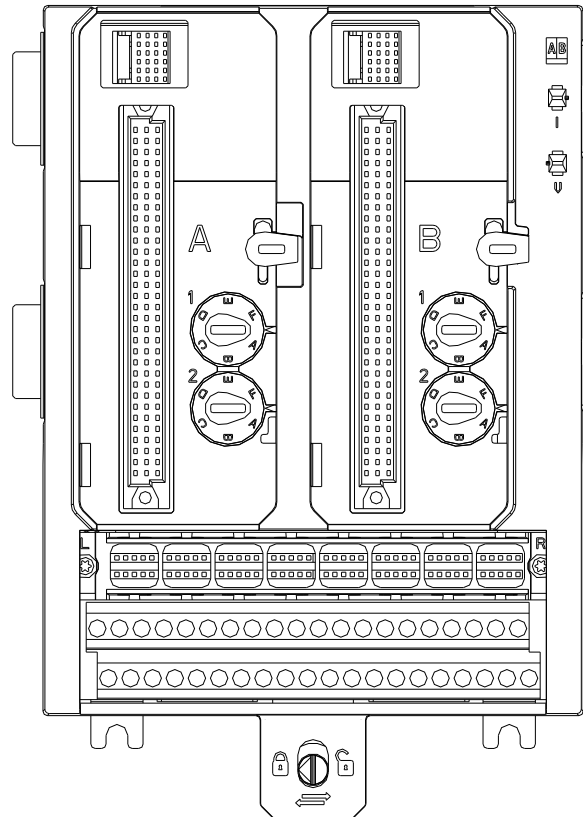
Block Diagram TU843



## TU844 Redundant Horizontal MTU

### Features

- 50 Volt applications - use with AI845, AI880, AI880A and DP840 modules.
- Complete installation of I/O modules using 2-wire connections and field power distribution.
- Up to 8 channels of field signals and process power connections.
- Connections to two ModuleBuses and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU844 is a 8 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a horizontal DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU844 MTU can have up to 8 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. Input signals are connected via individual shunt sticks, TY801. The shunt stick is used to

choose between voltage and current input. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel.

The MTU distributes the two ModuleBuses, one to each I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each I/O module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Technical Data

Table 145. TU844 Redundant Horizontal MTU Specifications

Item	Value
Process Connections	40 up to 8 I/O channels (2 terminals per channel) 4 Process power 20 Process power (0 V)
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A

Table 145. TU844 Redundant Horizontal MTU Specifications (Continued)

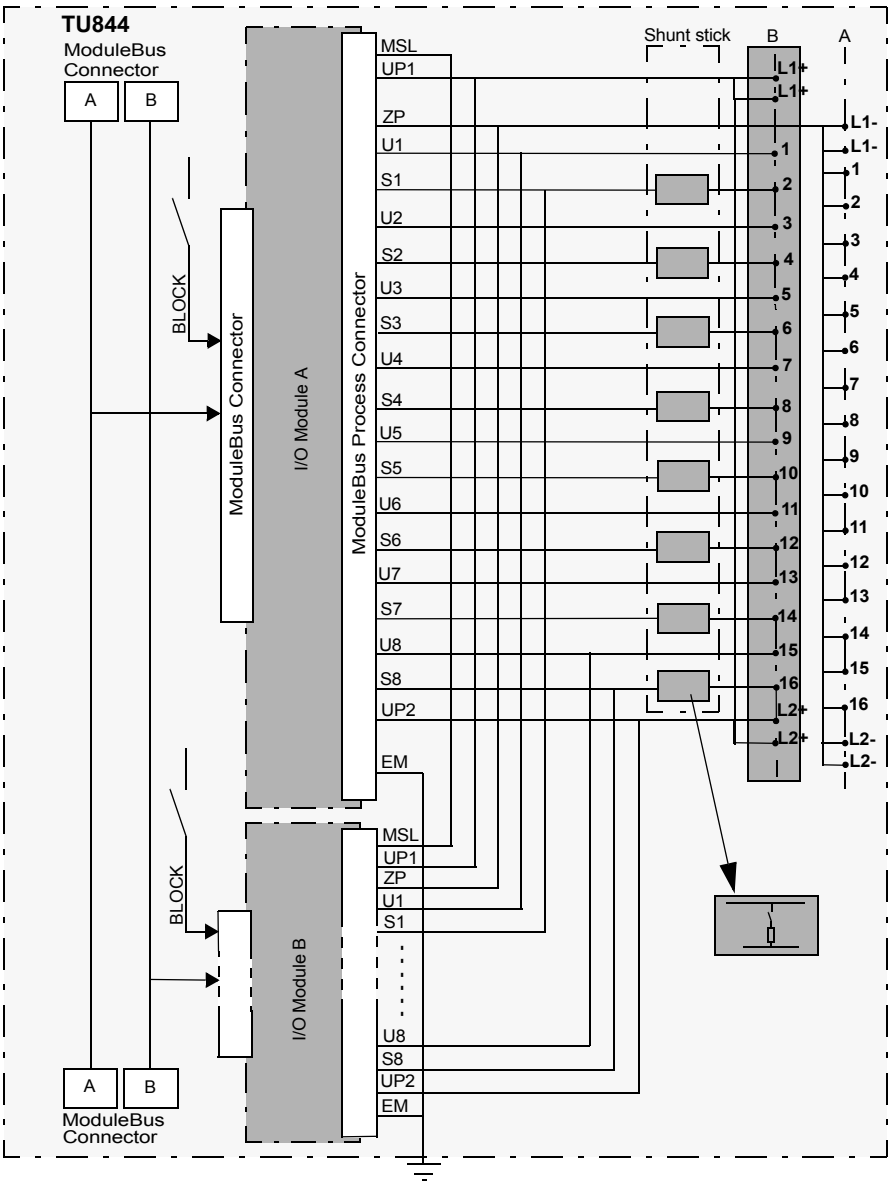
Item	Value
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	186.5 mm (7.34") including locking device
Weight	0.6 kg (1.3 lbs.)

## Connections

Table 146. TU844 Process Connection Screw Terminals (X1)

Position	Row A	Row B
1	L1-	L1+
2	L1-	L1+
3	A1	B1
4	2	2
5	3	3
6	4	4
7	5	5
8	6	6
9	7	7
10	8	8
11	9	9
12	10	10
13	11	11
14	12	12
15	13	13
16	14	14
17	15	15
18	A16	B16
19	L2-	L2+
20	L2-	L2+

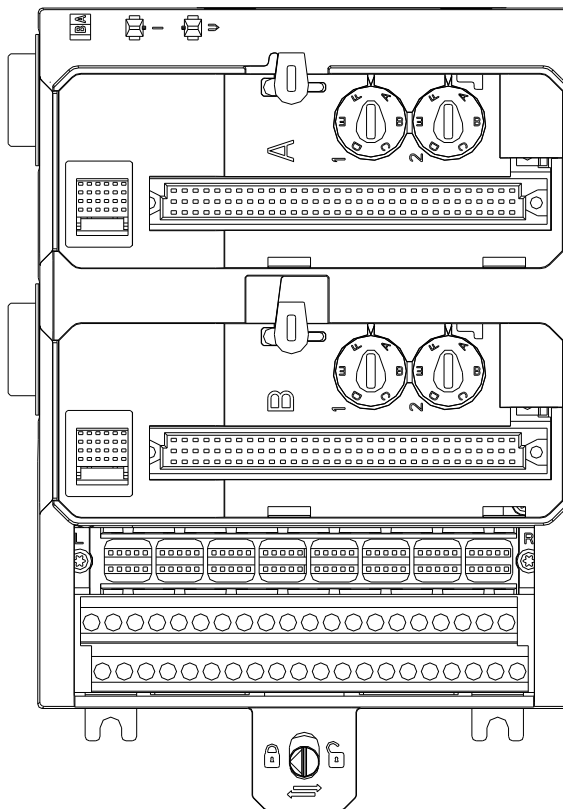
Block Diagram TU844



## TU845 Redundant Vertical MTU

### Features

- 50 Volt applications - use with AI845, AI880, AI880A and DP840 modules.
- Complete installation of I/O modules using 2-wire connections and field power distribution.
- Up to 8 channels of field signals and process power connections.
- Connections to two ModuleBuses and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.
- Include 8 individual shunt sticks.



### Description

The TU845 is a 8 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a vertical DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU845 MTU can have up to 8 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. Input signals are connected via individual shunt sticks, TY801. The shunt stick is used to choose between voltage and current input. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel.

The MTU distributes the two ModuleBuses, one to each I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each I/O module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Technical Data

Table 147. TU845 Redundant Vertical MTU Specifications

Item	Value
Process Connections	40 up to 8 I/O channels (2 terminals per channel) 4 Process power 20 Process power (0 V)
Rated maximum continuous current per I/O channel	2 A



Table 147. TU845 Redundant Vertical MTU Specifications (Continued)

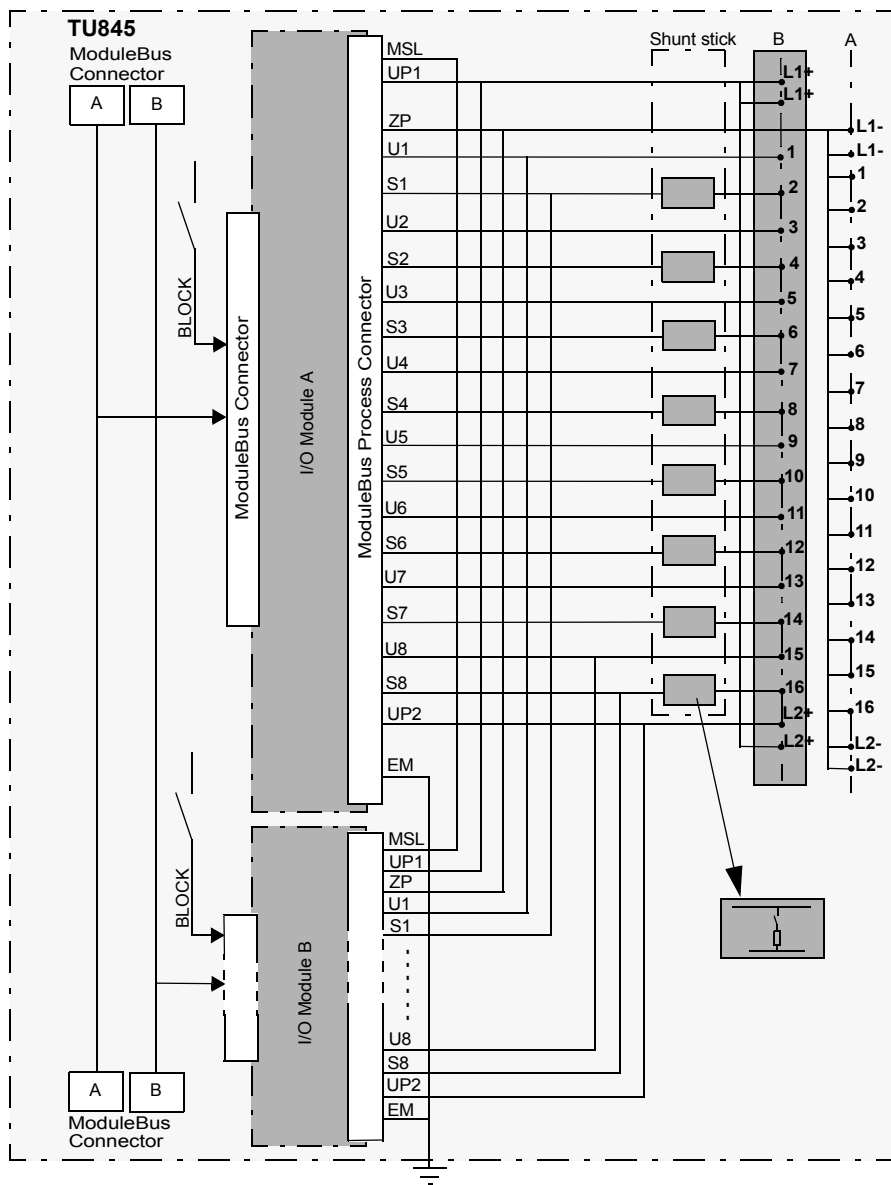
Item	Value
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	186.5 mm (7.34") including locking device
Weight	0.6 kg (1.3 lbs.)

## Connections

*Table 148. TU845 Process Connection Screw Terminals (X1)*

Position	Row A	Row B
1	L1-	L1+
2	L1-	L1+
3	A1	B1
4	2	2
5	3	3
6	4	4
7	5	5
8	6	6
9	7	7
10	8	8
11	9	9
12	10	10
13	11	11
14	12	12
15	13	13
16	14	14
17	15	15
18	A16	B16
19	L2-	L2+
20	L2-	L2+

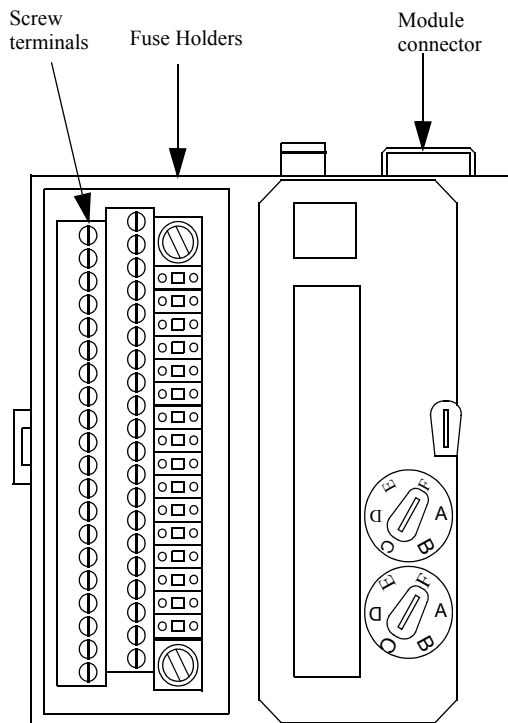
### Block Diagram TU845



## TU850 Extended MTU

### Features

- 50 Volt applications - use with the AI810, DI810, DI811, DI830, DI831, modules.
- Complete 2-wire connections for up to 16 channels.
- Each channel has one current limited sensor/transmitter power outlet terminal and one signal terminal.
- Current limitation in sensor/transmitter supply is implemented with disconnectable PTC fuse.
- Process voltage can be connected to 2 individually isolated groups, if the I/O module supports it.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU850 is a 16 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU850 MTU can have up to 16 I/O channels. The maximum rated voltage is 50 V and maximum rated current is 15mA per I/O channel (digital input) or 25mA per two I/O channels (analog input).

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into two equal and individually isolated groups. Each group consists of 8 I/O channels, 8 current limited sensor/transmitter power outlets, and process voltage connection. Process voltage can be connected to two individually isolated groups, only valid if the I/O module supports that. Current limitation in sensor supply is implemented with disconnectable PTC fuses.

**Technical Data***Table 149. TU850 Extended MTU Specifications*

Item	Value
Process connections	40 up to 16 I/O channels 16 current limited sensor/transmitter power outlets D-sub connectors 25 pin (male)
Rated maximum continuous current per process voltage connection	2 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Rated max. continuous current per channel	15 mA per I/O channel (digital input) or 25 mA per two I/O channels (analog input)
Fuse (2)	2A (fast glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 4 mm <sup>2</sup> Stranded: 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm Stripping length: 7 mm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed

Table 149. TU850 Extended MTU Specifications (Continued)

Item	Value
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.26 kg (0.57 lbs.)

**Connections**

Table 150. TU850 Process Connection Screw Terminals (X1)

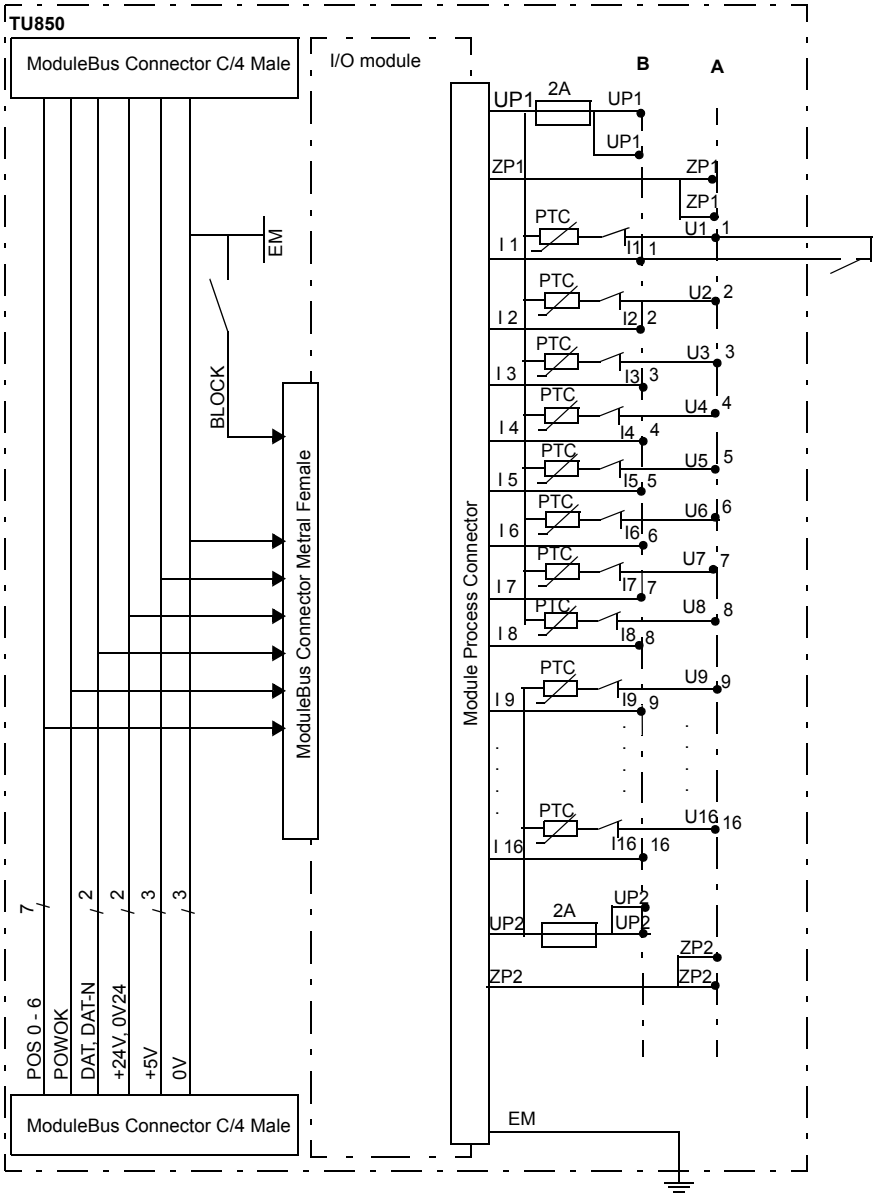
Row A	Row B
L1- (L1- power)	L1+ (L1+ power)
L1- (L1- power)	L1+ (L1+ power)
A1 (U1)	B1 (signal)
A2 (U2)	B2 (signal)
A3 (U3)	B3 (signal)
A4 (U4)	B4 (signal)
A5 (U5)	B5 (signal)
A6 (U6)	B6 (signal)
A7 (U7)	B7 (signal)
A8 (U8)	B8 (signal)
A9 (U9)	B9 (signal)
A10 (U10)	B10 (signal)
A11 (U11)	B11 (signal)
A12 (U12)	B12 (signal)
A13 (U13)	B13 (signal)

Table 150. TU850 Process Connection Screw Terminals (XI) (Continued)

Row A	Row B
A14 (U14)	B14 (signal)
A15 (U15)	B15 (signal)
A16 (U16)	B15 (signal)
L2- (L2- power)	L2+ (L2+ power)
L2- (L2- power)	L2+ (L2+ power)



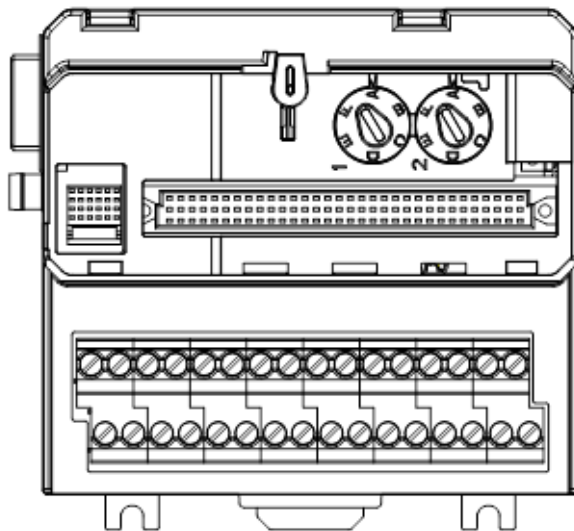
Block Diagram TU850



## TU851 Extended MTU

### Features

- 250 Volt applications - use with DI820, DI821, DI825, DI828, DO820, DO821, and DO828 I/O modules.
- Up to 16 isolated channels of field signals.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU851 is a 16 channel 250 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU851 MTU can have up to 16 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the

functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 16 individually isolated I/O channels. Each channel has two connections.

### Technical Data

*Table 151. TU851 Compact MTU Specifications*

Item	Value
Process connections	32 up to 16 I/O channels
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4mm <sup>2</sup> Stranded: 0.2 - 4 mm <sup>2</sup> , 24 - 10 AWG
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class II according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.

Table 151. TU851 Compact MTU Specifications (Continued)

Item	Value
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.22 kg (0.48 lbs.)

**Connections***Table 152. TU851 Process Connection 32 Pole Screw-Terminals (XI)*

<b>Position</b>	<b>Row A</b>	<b>Row B</b>
1	A1	B1
2	B2	A2
3	B3	A3
4	B4	A4
5	B5	A5
6	B6	A6
7	B7	A7
8	B8	A8
9	B9	A9
10	B10	A10
11	B11	A11
12	B12	A12
13	B13	A13
14	B14	A14
15	B15	A15
16	B16	A16

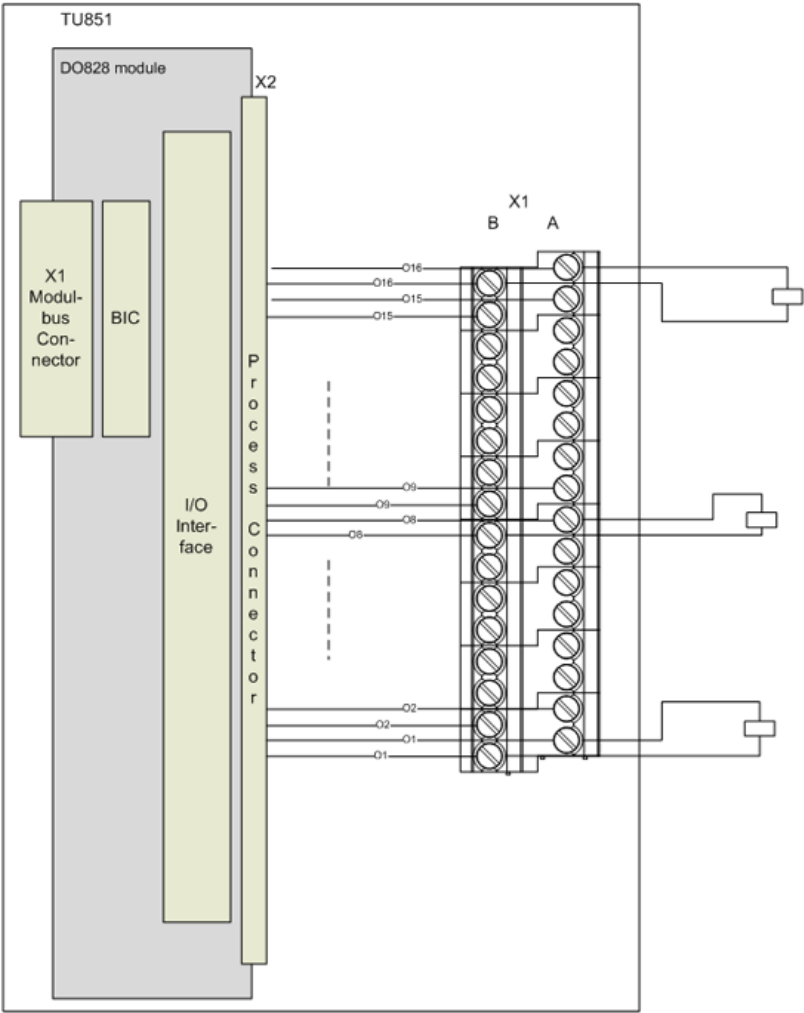
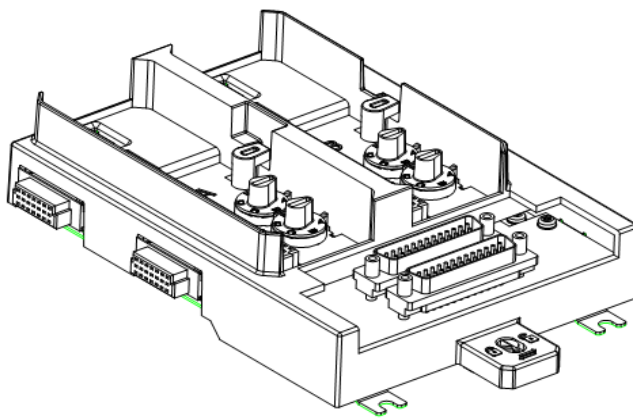


Figure 258. TU851 Process Connection

## TU852 Redundant Horizontal Dual MTU

### Features

- 50 Volt applications - use with AI843, AO845A, DI840, DI880, DO840, DO880 and DP840 I/O modules.
- Horizontal installation of I/O modules using D-sub connectors.
- Up to 16 channels of field signals and process power connections.
- Connections to two ModuleBuses and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU852 is a 16 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a horizontal DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU842 MTU can have up to 16 I/O channels and process voltage connections. Each channel has two uncommitted I/O connections. Normally S1-16 (signals) on X1A and U1-16 (power out) on X1B. Each DB25 include terminals for ZP, UP and EM.

The MTU distributes the two ModuleBuses to each I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each I/O module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Technical Data

Table 153. TU852 Redundant Horizontal MTU Specifications

Item	Value
Process Connections	16 up to 16 I/O channels (2 terminals per channel), Two D-sub connectors 25 pin (male)
Rated maximum continuous current per I/O channel	3 A
Rated maximum continuous current per process voltage connection (L+)	10 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation



Table 153. TU852 Redundant Horizontal MTU Specifications (Continued)

Item	Value
Equipment class	Class II according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	186.5 mm (7.34") including locking device

**Connection***Table 154. Process connection D-sub 25 (X1A and X1B)*

<b>X1A</b>		<b>X1B***</b>	
Pin.	MTU Signal	Pin.	MTU Signal
1	UP1	1	UP1
14	UP1	14	UP1*
2	ZP	2	ZP
15	ZP	15	ZP
3	S1	3	U1
16	S2	16	U2
4	S3	4	U3
17	S4	17	U4
5	S5	5	U5
18	S6	18	U6
6	S7	6	U7
19	S8	19	U8
7	S9	7	U9
20	S10	20	U10
8	S11	8	U11
21	S12	21	U12
9	S13	9	U13
22	S14	22	U14
10	S15	10	U15
23	S16	23	U16
11	UP2	11	UP2

Table 154. Process connection D-sub 25 (X1A and X1B)

X1A		X1B***	
Pin.	MTU Signal	Pin.	MTU Signal
24	UP2	24	UP2**
12	ZP	12	ZP
25	ZP	25	ZP
13	EM	13	EM

\* [S+] Function in AI843 module

\*\* [I\_cjc 0,24mA] Function in AI843 module

\*\*\* Not used on: AO845A, DO840 and DO880

Process Connections

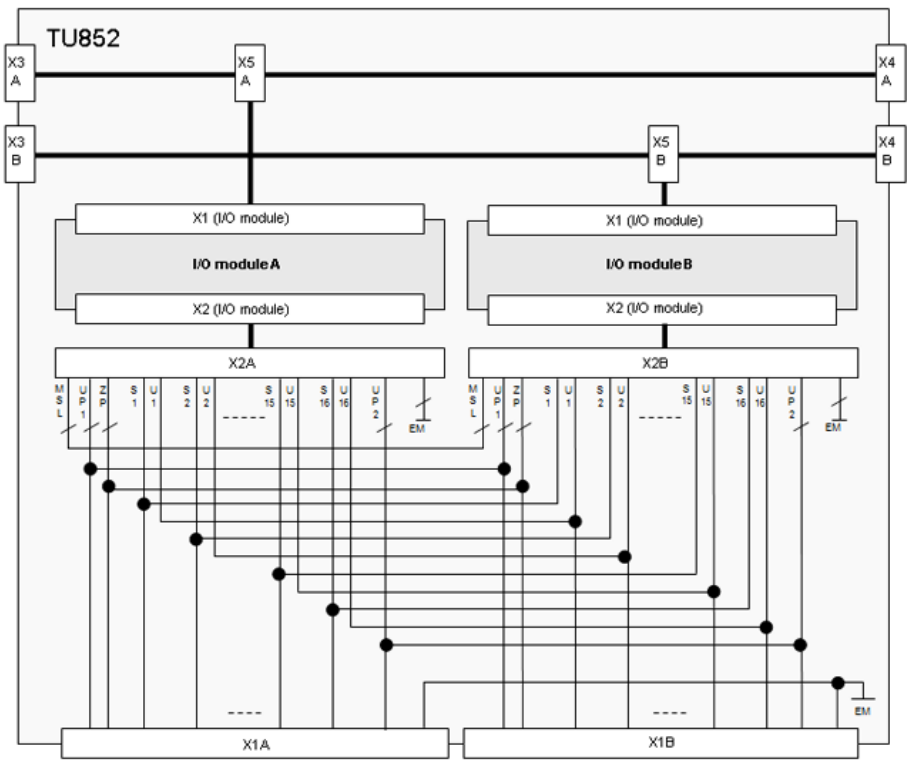
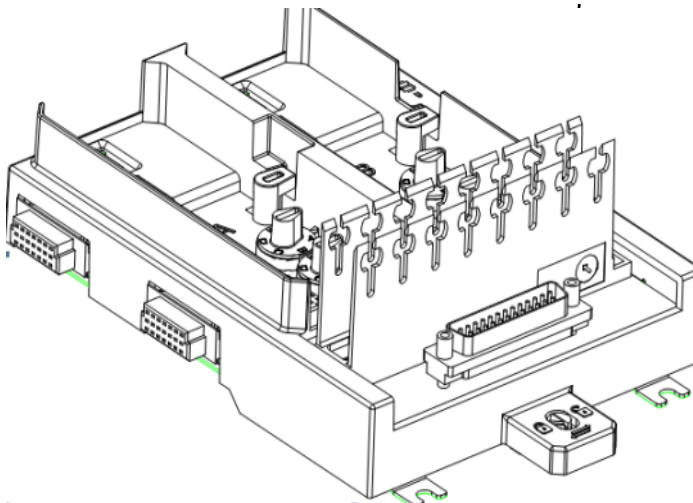


Figure 259. TU852 - Block Diagram

## TU854 Redundant Horizontal MTU

### Features

- 50 Volt applications - use with AI845, AI880A and DP840 modules.
- Horizontal installation of I/O modules using D-sub connectors.
- Up to 8 channels of field signals and process power connections.
- Connections to two ModuleBuses and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.



### Description

The TU854 is a 8 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a horizontal DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU854 MTU can have up to 8 I/O channels and process voltage connections. Each channel has two I/O connections. Input signals are connected via individual shunt sticks, TY801.

The MTU distributes the two ModuleBuses, one to each I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each I/O module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Technical Data

Table 155. TU854 Redundant Horizontal MTU Specifications

Item	Value
Process Connections	8 up to 8 I/O channels (2 terminals per channel) D-sub connector 25 pin (male)
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation

*Table 155. TU854 Redundant Horizontal MTU Specifications (Continued)*

Item	Value
Equipment class	Class II according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	186.5 mm (7.34") including locking device

**Connection***Table 156. Process connection X1 D-sub 25*

<b>X1</b>		
Pin.	MTU Signal	Description
1	UP	Incoming field power (+)
14	UP	Incoming field power (+)
2	ZP	Incoming field power (-)
15	ZP	Incoming field power (-)
3	Supply, Ch1	Transducer supply output, ch1
16	U/I_IN, Ch1	Voltage/Current input, ch1
4	Supply, Ch2	Transducer supply output, ch2
17	U/I_IN, Ch2	Voltage/Current input, ch2
5	Supply, Ch3	Transducer supply output, ch3
18	U/I_IN, Ch3	Voltage/Current input, ch3
6	Supply, Ch4	Transducer supply output, ch4
19	U/I_IN, Ch4	Voltage/Current input, ch4
7	Supply, Ch5	Transducer supply output, ch5
20	U/I_IN, Ch5	Voltage/Current input, ch5
8	Supply, Ch6	Transducer supply output, ch6
21	U/I_IN, Ch6	Voltage/Current input, ch6
9	Supply, Ch7	Transducer supply output, ch7
22	U/I_IN, Ch7	Voltage/Current input, ch7
10	Supply, Ch8	Transducer supply output, ch8
23	U/I_IN, Ch8	Voltage/Current input, ch8
11	UP	Incoming field power (+)



Table 156. Process connection XI D-sub 25

X1		
Pin.	MTU Signal	Description
24	UP	Incoming field power (+)
12	ZP	Incoming field power (-)
25	ZP	Incoming field power (-)
13	EM	Ground

Figure 260 shows the TU854 process connection.

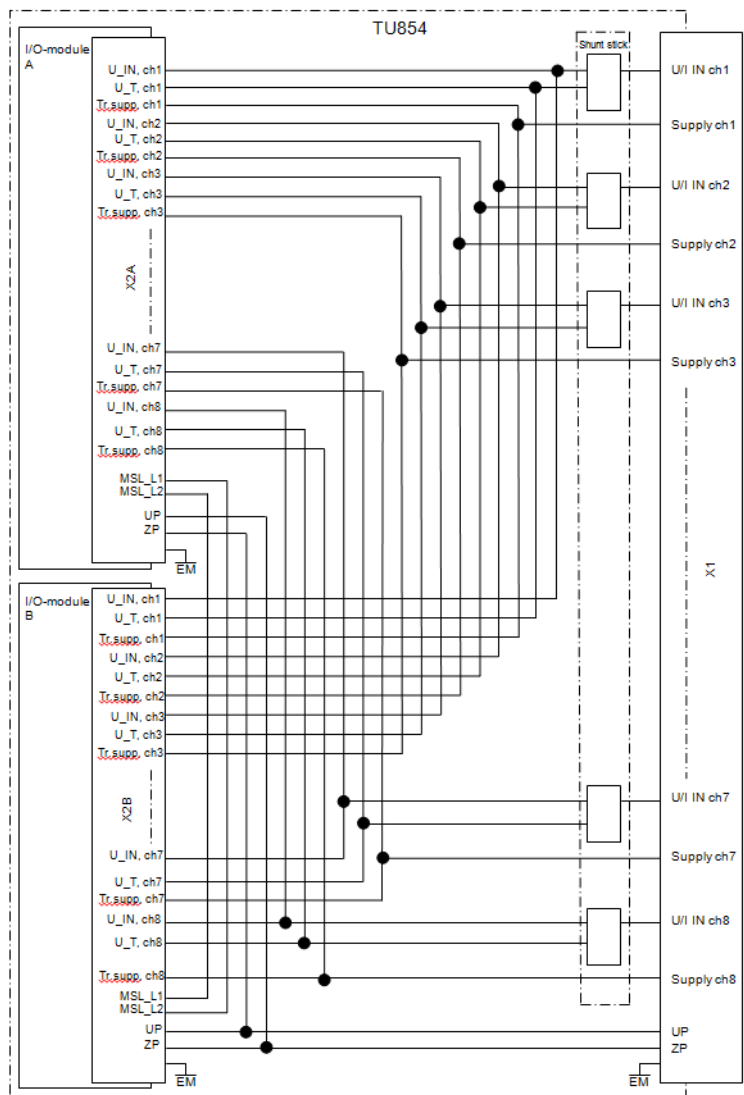


Figure 260. TU854 Process Connection

# TY801 Shunt Stick

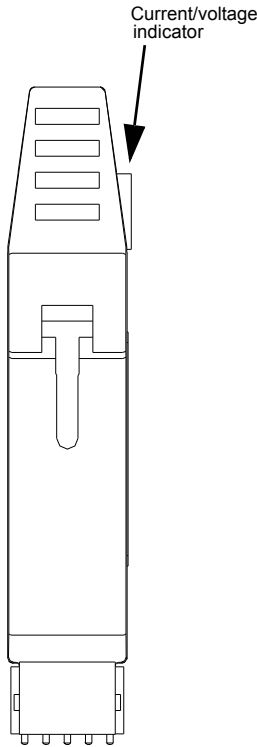
**Features**

- Passive unit used for configuration of signal type.
- Used with TU834, TU844 and TU845 together with AI845 or AI880/AI880A.

**Description**

The TY801 Shunt Stick is used to adjust the input for current or voltage signals.

In the upper corner of the shunt stick there is a part of the circuit board that is visible. If the visible part is to the left, the shunt stick is configured for voltage and if it is to the right it is configured for current.



**Technical Data**

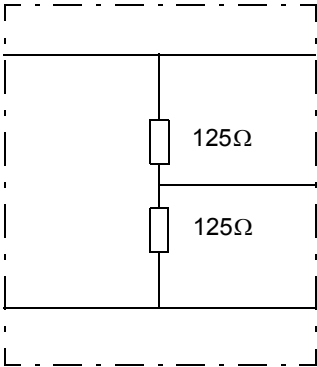
Table 157. TY801 Shunt Stick Specifications

Item	Value
Module catch	Attaches module MTU TU834/TU844/TU845
Internal resistance	2 x 125 $\Omega$ , 0.05%
Equipment class	Class I according to IEC 61140; (earth protected)
Protection Rating	IP20 according to IEC 60529

Table 157. TY801 Shunt Stick Specifications (Continued)

Item	Value
Rated Insulation Voltage	50 V
Dielectric test voltage	500 V a.c.
Width	11 mm (0.43")
Depth	15,5 mm (0.61")
Height	62 mm (2.44")
Weight	6 g (0.013 lbs.)

Block Diagram TY801



# TY804 Shunt Stick

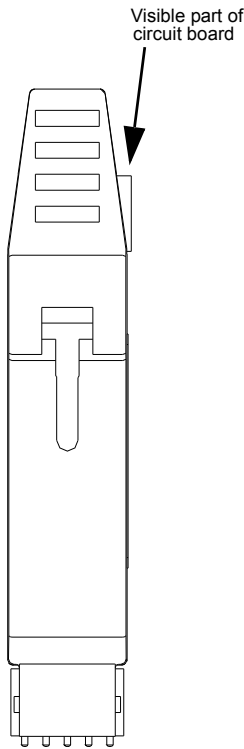
**Features**

- Passive unit used for configuration of signal type.
- Used on TU844 and TU845 together with DP840.

**Description**

The TY804 Shunt Stick is used to adjust the input current to a voltage signal.

In the upper corner of the shunt stick there is a part of the circuit board that is visible. The visible part shall be turned to the right (current input) when the shunt stick is mounted.



**Technical Data**

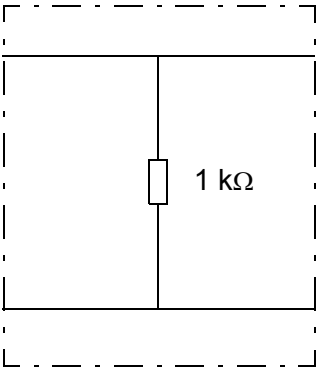
Table 158. TY804 Shunt Stick Specifications

Item	Value
Module catch	Attaches module MTU TU844/TU845
Internal resistance	1.08 kΩ 1%
Equipment class	Class I according to IEC 61140; (earth protected)
Protection Rating	IP20 according to IEC 60529

Table 158. TY804 Shunt Stick Specifications (Continued)

Item	Value
Rated Insulation Voltage	50 V
Dielectric test voltage	500 V a.c.
Width	11 mm (0.43")
Depth	15,5 mm (0.61")
Height	62 mm (2.44")
Weight	6 g (0.013 lbs.)

Block Diagram TY804



# TY820 Temperature Sensor

**Features**

- Passive unit for measuring of temperature.
- Used together with AI835/AI835A and AI843 for measuring of the cold junction temperature

**Description**

The TY820 is temperature sensor with a PT 100 element casted in a transparent plastic material. The temperature sensor has a 4-wire connection.



**Technical Data**

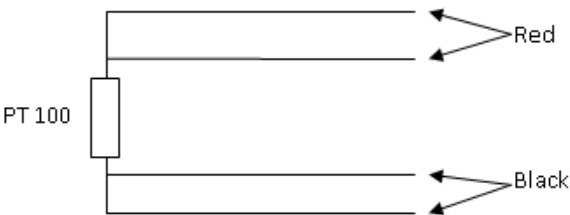
Table 159. TY820 Temperature Sensor Specifications

Item	Value
Sensor	Pt 100 class B
Temperature range	- 40 to 100°C (-40 to 212°F)
Time constant	3.5 minutes
Protection Rating	IP20 according to IEC 60529
Width	20 mm (0.79")
Depth	8 mm (0.31")
Height	13 mm (0.51")

Table 159. TY820 Temperature Sensor Specifications (Continued)

Item	Value
Weight	8g (0.017 lbs)
Connection wires	Area: 0.5 mm <sup>2</sup> (20 AWG) Length: 200mm (7.87")

Block Diagram TY820





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# Appendix B Certifications

## Certifications

The S800 I/O system is continuously enhanced with additional certificates.  
[Table 160](#) describes the current certifications.

Table 160. Current Certifications for S800 Modules

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL3
Analog Input Modules						
AI801	X	X	X			
AI810	X	X	X			
AI815	X	X	X			
AI820	X	X	X			
AI825	X	X				
AI830	X	X	X			
AI830A	X	X	X			
AI835	X	X	X			
AI835A	X	X	X			
AI843	X	X	X			

Table 160. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL3
AI845	X	X	X			
AI880/ AI880A	X	X	X	X		X
<b>Analog Output Modules</b>						
AO801	X	X	X			
AO810	X	X	X			
AO810V2	X	X	X			
AO815	X	X	X			
AO820	X	X	X			
AO845	X	X	X			
AO845A	X	X	X			
<b>Field Communication Interface</b>						
CI801	X	X	X			
CI810B	X	X	X			
CI820V1	X	X	X			
CI830	X	X	X			
CI840	X	X	X			

Table 160. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL3
CI840A	X	X	X			
TB815	X	X	X			
<b>Advant Fieldbus 100</b>						
TC501V150	X					
TC506	X					
TC513V1	X					
TC514V2	X					
TC515V2	X					
<b>Digital Input Modules</b>						
DI801	X	X	X			
DI802	X	X				
DI803	X	X				
DI810	X	X	X			
DI811	X	X	X			
DI814	X	X	X			
DI818	X					
DI820	X	X				

Table 160. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL3
DI821	X	X				
DI825	X	X				
DI828	X					
DI830	X	X	X			
DI831	X	X	X			
DI840	X	X	X			
DI880	X	X	X	X		X
DI885	X	X	X			
<b>Digital Output Modules</b>						
DO801	X	X	X			
DO802	X	X				
DO810	X	X	X			
DO814	X	X	X			
DO815	X	X	X			
DO818	X					
DO820	X	X				
DO821	X	X				
DO828	X					

Table 160. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL3
DO840	X	X	X			
DO880	X	X	X	X		X
<b>Power supply and voter</b>						
SD821 <sup>(4)</sup>	X	X				
SD822 <sup>(4)</sup>	X	X				
SD823 <sup>(4)</sup>	X	X				
SS822 <sup>(4)</sup>	X	X				
SD832	X	X				
SD833	X	X				
SD834	X	X	X			
SS823	X	X	X			X
SS832	X	X				
<b>Pulse Counting Modules</b>						
DP820	X	X	X			
DP840	X	X	X			

Table 160. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL3
<b>Module Termination Units</b>						
TU807	X	X	X			
TU810V1	X	X	X			
TU811V1	X	X				
TU812V1	X	X	X			
TU813	X	X				
TU814V1	X	X	X			
TU818	X					
TU819	X					
TU830V1	X	X	X			
TU831V1	X	X				
TU833	X	X	X			
TU834	X	X	X			
TU835V1	X	X	X			
TU836V1	X	X				
TU837V1	X	X				
TU838	X	X	X			
TU839	X	X				
TU840	X	X	X	X		

Table 160. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL3
TU841	X	X	X	X		
TU842	X	X	X	X		
TU843	X	X	X	X		
TU844	X	X	X	X		
TU845	X	X	X	X		
TU846	X	X	X			
TU847	X	X	X			
TU848	X	X	X			
TU849	X	X	X			
TU850	X	X	X			
TU851	X					
TU852	X					
TU854	X					
TU890	X				X	
TU891	X					
TY801	X	X	X	X		
TY804	X					

Table 160. Current Certifications for S800 Modules (Continued)

Module Type Designation	CE	cULus El. safety	cULus Hazardous Location Class1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL3
<b>ModuleBus Communication Parts</b>						
TB805	X	X	X			
TB806	X	X	X			
TK801V003	X					
TK801V006	X					
TK801V0012	X					
TB807	X	X	X			
TB810	X	X	X			
TB811	X	X	X			
TB820V2	X	X	X			
TB825	X	X	X			
TB826	X	X	X			
TB840/ TB840A	X	X	X	X		
TB842	X	X	X			
TB845	X	X	X			
TB846	X	X	X			

(1) Marking for mounting and interface: Class 1 Zone 2 AEx nA IIC T4 Gc X

(2) Marking for mounting and interface: Ex II 3G Ex nA IIC T5 Gc

(3) Marking for mounting: Ex II 3G Ex nA II T4  
Marking for interface: Ex II (1)G [EEx ia] IIC

(4) cULus; UL508, UL1950, CSA 22.2 No 950



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# Appendix C Hardware Units for Essential Automation

A selection of the units described in this book is also available as versions for Essential Automation. These units have exactly the same technical specifications, but differ in the following characteristics.

- Electronically recognizable - S800 IO hardware status shows text 'eA'
- Color - main unit is in gray
- Type designation - name ends with '-eA'
- Article number - part ends with R2 instead of R1

The [Table 161](#) lists the -eA units, certificates and type approvals that currently applies to each unit.

*Table 161. All -eA Units and Certifications*

Available eA Modules	CE	cULus Electrical Safety	cULus Hazardous Location Class 1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL 3	Marine Approval
AI801-eA	X	X	X				
AI810-eA	X	X	X				
AI815-eA	X	X	X				
AI820-eA	X	X	X				

Table 161. All -eA Units and Certifications

Available eA Modules	CE	cULus Electrical Safety	cULus Hazardous Location Class 1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL 3	Marine Approval
AI825-eA	X	X					
AI830A- eA	X	X	X				
AI835A- eA	X	X	X				
AI843-eA	X	X	X				
AI845-eA	X	X	X				
AO801-eA	X	X	X				
AO810V2- eA	X	X	X				
AO815-eA	X	X	X				
AO820-eA	X	X	X				
AO845A- eA	X	X	X				
DI801-eA	X	X	X				
DI802-eA	X	X					
DI803-eA	X	X					
DI810-eA	X	X	X				
DI811-eA	X	X	X				
DI814-eA	X	X	X				
DI818-eA	X						

Table 161. All -eA Units and Certifications

Available eA Modules	CE	cULus Electrical Safety	cULus Hazardous Location Class 1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL 3	Marine Approval
DI820-eA	X	X					
DI821-eA	X	X					
DI825-eA	X	X					
DI828-eA	X						
DI830-eA	X	X	X				
DI831-eA	X	X	X				
DI840-eA	X	X	X				
DO801-eA	X	X	X				
DO802-eA	X	X					
DO810-eA	X	X	X				
DO814-eA	X	X	X				
DO815-eA	X	X	X				
DO818-eA	X						
DO820-eA	X	X					
DO821-eA	X	X					
DO828-eA	X						
DO840-eA	X	X	X				
DP820-eA	X	X	X				
DP840-eA	X	X	X				
CI801-eA	X	X	X				

Table 161. All -eA Units and Certifications

Available eA Modules	CE	cULus Electrical Safety	cULus Hazardous Location Class 1 Zone 2 <sup>(1)</sup>	ATEX Hazardous Location Zone 2 <sup>(2)</sup>	ATEX Hazardous Location Installation in Zone 2 Interface to Zone 0 <sup>(3)</sup>	SIL 3	Marine Approval
CI840A- eA	X	X	X				
TB820V2- eA	X	X	X				
TB825-eA	X	X	X				
TB840A- eA	X	X	X				
TB826-eA	X	X	X				

(1) Marking for mounting and interface: Class 1 Zone 2 AEx nA IIC T4 Gc X

(2) Marking for mounting and interface: Ex II 3G Ex nA IIC T5 Gc

(3) Marking for mounting: Ex II 3G Ex nA II T4  
Marking for interface: Ex II (1)G [EEx ia] IIC

(4) cULus; UL508, UL1950, CSA 22.2 No 950

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